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Two Fundamentals in Purchasing

Establishing and Visualizing Definitions, Particularly of Small Articles—Classifying Suppliers in Exact Terms of Products Obtainable

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In a recent number of this journal an article of mine was published containing some suggestions and recommendations concerning purchasing, and several letters have been received requesting more information governing the actual operation of this department of a business.

While it is not possible to give specific rules and forms which could be adopted by every establishment, nevertheless helpful suggestions may be obtained by some and others may be able to apply to their own uses the methods illustrated, modified to suit their particular requirements or conditions.

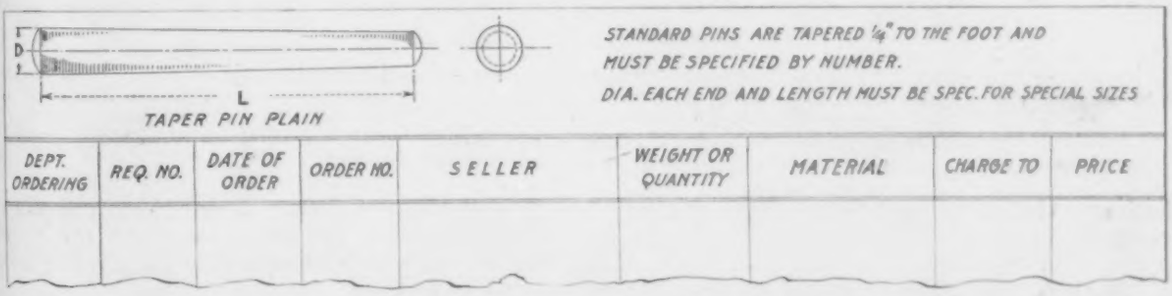

FIG. 1—RECORD OF PURCHASE ORDERS

All orders for taper pins should be recorded on this sheet or card. Whenever possible, the article should be illustrated as shown, as it shows the correct method of specifying dimensions. Standard definitions are thus enforced for every purchase. By the constant visualization of these illustrations and definitions in the daily routine clerical work, mistakes are avoided. For instance, a requisition comes into the purchasing department for "10 gross of hack saw blades," the supposition being that everybody knows the size always used. Somebody may know that 12-in. blades, 14 teeth, are required, but if to this instance hundreds of others are added it becomes a positive necessity to have standard definitions enforced.

There are two great fundamentals to be determined in making every purchase. One is the question of buying the right article and the other is the question of buying from the right source. If these two essentials are properly taken care of the subsequent work of the department will proceed smoothly and easily. This means that the physical and mechanical work of the department will be conducted at a high percentage of efficiency. Quotations will be obtained quickly and goods will be bought at lowest market prices. Deliveries will be made at approximately exact dates promised and following up shipments facilitated. Invoices will be received and checked promptly. Useless and superfluous correspondence regarding prices, shipments and invoices will be avoided.

However ably conducted a purchasing department may be it is no exaggeration to say that at times every phase of its work mentioned above suffers as a consequence of insufficient attention being given to one or both of the two fundamentals named. In those cases where they are neglected or treated as of no importance, the conditions under which the department operates are laborious and sometimes almost chaotic. A little additional care and work is necessary at first, but this is offset many times over by the advantages and benefits secured by starting right.

BUYING THE RIGHT MATERIALS

The buying of right materials depends mainly on correct definitions and specifications. The actual decision as to the specific article or material does not always come within the jurisdiction of the purchasing agent. In practically all our large manufacturing establishments, railroads and public service corporations, exhaustive tests and experiments have predetermined the question of the most suitable material and a complete specification covering it should be furnished the purchasing agent. For the purpose of canvassing the market for prices and placing orders a sufficient number of these specifications should be kept on file properly indexed

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ready for reference and use at a moment's notice.

It may seem from this that the work of the purchasing agent is largely confined to specializing on price and delivery, but a great deal more than this is involved, for he should know something of the previous history of the material he is buying and its antecedent manufacturing processes. It is often useful to have some general knowledge of the physical and chemical characteristics of the material. The average buyer is commercially rather than technically trained and it is not to be assumed that a man buying a wide variety of materials can be thoroughly informed technically regarding all his purchases. But he can have a superficial knowledge of technical and mechanical subjects which he will find of inestimable value.

Having a well arranged filing system with folders containing a sufficient number of the specifications furnished by the engineering staff or those which embody detailed technical terms, there remains an enormous number of small articles for which standard definitions should be established. This can well be done by the purchasing department, as it is familiar with the practice of the manufacturers. This applies to such things as bolts, nuts, screws, washers, all kinds of small tools such as hack-saw blades, drills, files, etc., also supplies of every description, such as brushes, brooms, waste, packing materials, etc.

To those not actually engaged in the work of purchasing, it may seem inconceivable that so many petty questions could arise, as frequently happens, in connection with the correct specifying of these small articles. The writer has had to handle large batches of requisitions as they arrived in the purchasing department from various sources and the same article has often been described in varying ways. For instance, one man will give the thickness first and the length second, while another will reverse this, or perhaps give the length of oval head and countersunk head rivets including length of head in both cases, whereas the length of the former should be given from under the head.

Such things as these are a source of constant annoyance and entail a large amount of work on the purchasing staff in unraveling the ambiguous descriptions and straightening out the kinks. This must be done before prices can be obtained or orders placed. This is a serious handicap to the economic administration of the department and the establishment, but can be rectified by better methods.

There are many purchasing departments who look upon this feature of the work of buying as a necessary evil and there are far too many which do not exercise sufficient care to beat the requisitions into uniform and intelligent shape before going into the market. Probably every business house could recite instances of receiving from buyers unintelligible descriptions and definitions, or, as frequently happens, the inquiry or order is worded in such a way as to be applicable to more than one article.

What this means to the business world cannot be calculated, but that it is a serious economic loss is undeniable and practically every business house would testify to this effect.

There are no valid reasons why a foreman should describe an article one way, the storekeeper another way and the purchasing agent still another. The purchasing department can be largely instrumental in securing the adoption of uniform and standard definitions. In fact, that department is best fitted to do it because it is in constant touch with the manufacturers and vendors and should be conversant with their standard practices.

Some large manufacturers have compiled in book form standard definitions and illustrations. These are excellent in their way, but do not fit every case, and cannot be made comprehensive enough to cover many articles in the nature of supplies. They are purely reference data and are naturally only referred to when in doubt. A man frequently thinks he knows the correct definition of an article and does not refer to his standard practice book—quite often he is wrong.

A good scheme is to have the definitions visualized so that the daily routine work cannot be accomplished without being brought into contact with them. In the storekeeping and purchasing departments several forms are used which can be utilized for this purpose. There are the following: Stores record, record of sources of supply, quotation record, purchase order record; and we will take the last named for purpose of illustration, as in Fig. 1. If standard methods are put in force for defining each article and printed on one or all of these forms as necessity dictates, the men using and referring to them cannot get away from the daily visualization of them and it becomes second nature to correctly specify each item.

These definitions or specifications may consist of only two or three words or figures. They should be short and concise, but at the same time complete. Brevity and clarity are essential.

Having in good working order a system such as outlined, the buyer is always sure of getting the exact article and material needed; he is positively certain when he asks for prices that bids are based on his actual requirements, and he knows that there will be no "come backs" and no questions asked to

MATERIAL OR ARTICLE } _____ DESCRIPTION _____ SPEC. NO.

SELLER	ADDRESS	FACTORY			REPUTATION AND SERVICE					CAT. NO.	SPECIAL REMARKS
		CAPACITY	LOCATION	TRANSP'N FACILITIES	QUALITY	BUSINESS METHODS	FINAN'L STAND'G	KEEP'G. PROMS.	SHIPP'G. PROMPT'Y.		

FIG. 2—RECORD OF SOURCES OF SUPPLY

By keeping a record as indicated by this form a purchasing agent creates for himself a market of exactly those concerns who are best fitted to supply anything he buys. As explained in the text, this is a positive insurance against high prices and poor deliveries. If an article cannot be properly described in the space allotted, it should have a numbered specification in the files. It is important to know where the factory is located of those articles which are purchased through supply houses. Some of the information on this record can be indicated by code signs, words or figures.

clear up moot points and ambiguous meanings. He also has the positive assurance that all bidders are quoting for exactly the same article.

BUYING FROM THE RIGHT SOURCES

This is the second great fundamental alluded to and is of equal importance with the first. A register should be kept; either card index or loose-leaf ledger system can be used. See Fig. 2. Owing to the constant changes in manufacturing methods and to the fact that suppliers are frequently adding to the lines which they handle, this list can never be considered permanent. It is really the buyer's market and he can make it largely what he wills.

If this phase of purchasing is closely and assiduously followed up very valuable results will be achieved. To get the best prices, a purchasing agent must go to those concerns who are best fitted to supply his actual requirements. Invitations to quote for material cannot be sent out on a hit or miss principle. At the present time there is an enormous demand for nuts and all manufacturers are booked far ahead with orders. They naturally do not want to be put to the trouble and inconvenience of answering superfluous inquiries. Yet specifications are sent to them promiscuously by many purchasing departments.

Some of these manufacturers make only nuts for machine bolts, some for machine screws, some make only punched nuts and others only milled nuts. Now these and manufacturers of all other materials and articles can be segregated into those who are able to supply the purchaser's requirements and those who are not.

The economic administration of the business world would be very favorably affected if a closer and more direct connection were established between buyer and seller and loose and promiscuous shopping and bidding avoided. These better conditions can be largely established by the buyer. If he is not accurate in specifying his requirements or if he approaches houses which are unable to furnish his requirements, the loss in efficiency is not only his, but has a distinct effect over a very wide area. The seller is placed at a disadvantage and every business concern would testify to the fact that their expenses are largely increased by the time, work and outlay they incur in answering and attending to such inquiries and from which they have no hope of securing orders. This expense must be added to the cost of the goods and is eventually paid by some buyer.

It is incumbent, therefore, on the purchaser to confine his activities in canvassing the market to those houses which can supply exactly what he wants. This can be accomplished by research work and information derived from various sources. The trade papers can be referred to to great advantage; the commercial registers are useful, but for one's particular necessities the lists given in them frequently need further subdivision with the useful names culled and useless ones eliminated.

This subject could be elaborated on almost indefinitely, but enough has been said to emphasize its importance to the business world in general. The advantages to the buyer are positive and obvious. The right kind of competition will have been created because the firms bidding will be those best able to supply the goods required. Insurance against wasted energy will be secured. The danger of getting inferior quality will be practically eliminated and uncertain and irregular deliveries avoided.

This is an outline of the work of purchasing up to the actual placing of the orders, and if this has been properly done the subsequent routine work should be almost wholly clerical. By the competent and efficient handling of the various problems up to the point named, the purchasing agent has practically secured for his department the absolute assurance of the best results in the matter of price, quality and delivery.

Armor Plant Site Hearing

WASHINGTON, D. C., Sept. 16, 1916.—Secretary of the Navy Daniels conducted a public hearing Sept. 13 and 14 in connection with the act of Congress providing for the establishment of a Government armor plate factory, listening to representatives of commercial organizations urging the advantages of sites in 23 States. Department officials and others awaited the hearings with considerable interest to learn whether the Bethlehem, the Carnegie and the Midvale Steel companies would offer their properties to the Government. Representatives of all three companies were present, but only as spectators, making no statement. Previous to the hearings the three companies had been sent an invitation to make proposals.

The next step to be taken by Secretary Daniels will be to appoint a naval board to which will be referred the sites offered and the briefs filed in support of them. More than 50 printed briefs with maps and drawings were filed, and there were numerous typewritten briefs concerning the advantages of the sites they described. It was plain to see that the offers of sites were backed in most instances by commercial organizations of the unmistakable "booster" type, and that the promoters lacked in a marked degree knowledge of the requirements of a satisfactory site and environment of a highly specialized factory such as an armor plant. Places isolated from a fuel supply, without industrial activities of any kind, and with apparently nothing to offer but vacant land, filed elaborate briefs and maps.

There is a strong impression here that if the Government does actually embark in the erection of an armor plant, politics will play a strong part in the selection of the site. It is intimated that the plant will be located in the South, probably in the Birmingham district of Alabama. Senator Underwood and members of the Alabama delegation in the House, appeared before the Secretary in favor of sites in Birmingham, Gadsden, and Tuscaloosa, Alabama. Senator Chilton introduced a delegation which offered a site at Huntington, W. Va. Senator Swanson and Representative Carlson of Virginia introduced a delegation which offered sites in Norfolk, Richmond, Petersburg, Hopewell, and Alexandria. Senator James also appeared with a delegation offering Wickliffe, Paducah, Middlesboro and Cadiz, Kentucky. R. B. Beach, industrial commissioner of the Chicago Association of Commerce, presented an argument, not only for Chicago, but for the manufacturing district extending from Gary, Ind., to Waukegan, Ill.

Breaker Island, in the Hudson River at Troy, covering 175 acres, 100 miles north of West Point, and 150 miles north of New York City, was offered. It was argued that it would be advantageous to the Government to place the plant on this island because it would be within a mile of the Watervliet arsenal. Congressman Vare was at the head of a delegation which urged the Philadelphia Navy Yard as the ideal place for the plant, laying considerable stress on the fact that the report of the Tillman committee made such an assertion in favor of Philadelphia. Numerous Ohio cities presented claims for the plant and all filed voluminous briefs.

The belief prevails that when the whole matter is threshed out, armor will continue to be made at the plants of the Bethlehem, the Carnegie and the Midvale companies, on terms that will be advantageous to the Government and also to the companies. W. L. C.

The Secretary of the Navy will resume hearings on Friday of this week to decide where to locate the Government armor plant. Many additional towns and cities have asked to be heard.

The Human Factor in Foundry Production

Luther D. Burlingame, Industrial Superintendent of the Brown & Sharpe Mfg. Company, Describes Its Methods to New England Foundrymen

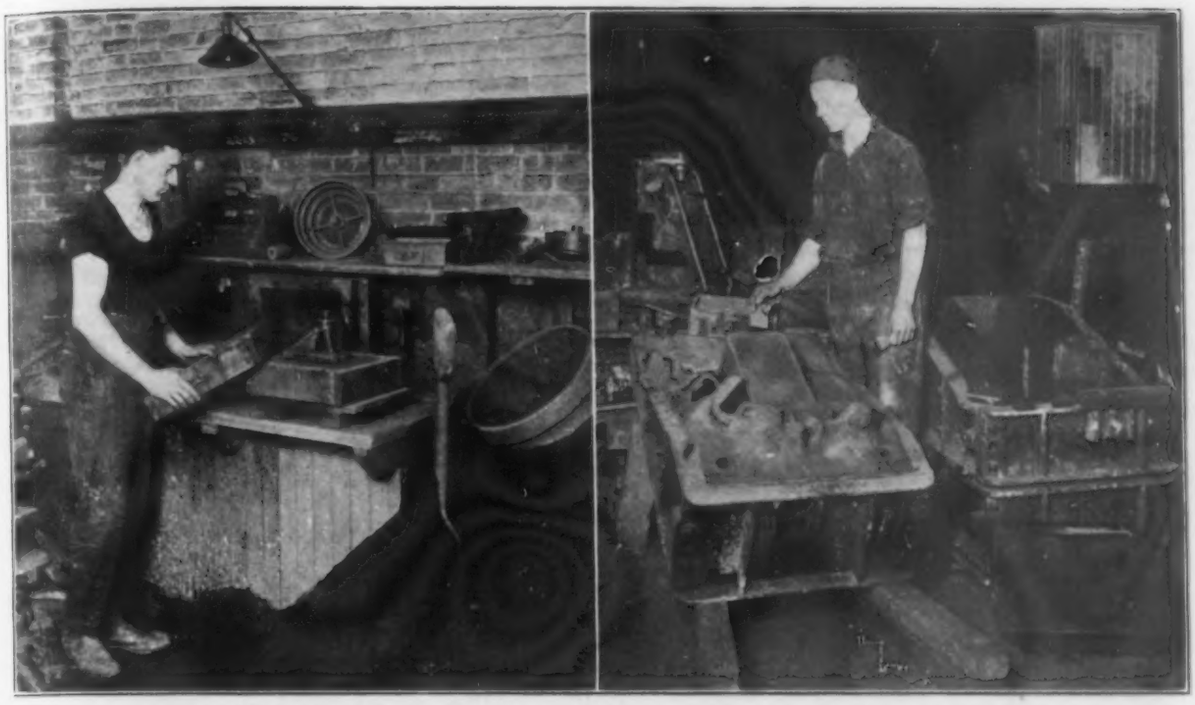
The first fall meeting of the New England Foundrymen's Association, held at the Exchange Club, Boston, Sept. 13, was made unusually interesting by a talk on "The Human Element in Foundry Production" which provoked a long and animated discussion of the problems confronting foundrymen—the scarcity of skilled labor, the influx of untrained foreign workers brought about by this condition, the wisdom of various types of welfare work, and yet more striking as an evidence of present prosperity, the problem of housing the automobiles and motor cycles of employees. There was keen interest in every phase of the pressing questions of instructing, protecting, and increasing the efficiency of foundry workers, the talk ranging over such widely dissimilar subjects as compulsory use of proper shoes and leggings, adequate installations of shower baths, formation of rifle clubs, and noon-day concerts and "movie" shows.

Following the dinner, which is always a feature of these monthly meetings, President Stephen E. French introduced as the speaker of the evening Luther D. Burlingame, industrial superintendent of the Brown & Sharpe Mfg. Company, Providence, R. I., who said in part:

There are three important factors in production—the equipment, the systems employed, and the human element. While in the past greater weight has been given to the first two factors and the human element has been left to take care of itself, a radical change is now taking place in the relative importance given to these factors and it is more and more being appreciated that the human element is, in the last analysis, the one most important in securing the results desired.

Andrew Carnegie said when he was actively connected with the steel industry that if some great catastrophe destroyed all his steel plants and equipment but left the personnel of his organization, he would have courage to start anew; but if all his vast equipment remained and he had to build up a new organization from the beginning with a new force of men, he would not feel that life was long enough to accomplish the task. It is not believed that any apologies are

One of the Naturalization Classes of the Brown & Sharpe Mfg. Company. The company provides the teaching of English and civics to foreign-born workmen. Guards are provided on the handles of wheelbarrows used on the charging floor, as shown in the upper picture. The buckle leggings shown on this workman have been discarded because of the difficulty of removing them quickly in case of necessity.



Types of the Boys Found Among the Apprentices in the Brown & Sharpe Foundry. In molding they serve for three years at standard rates of 14, 16 and 18 cents per hour, but are frequently given piece work so that they earn materially more than the established rates. They pay $25 at the completion of a trial period as an evidence of good faith and are paid a bonus of $100 at the successful completion of their term

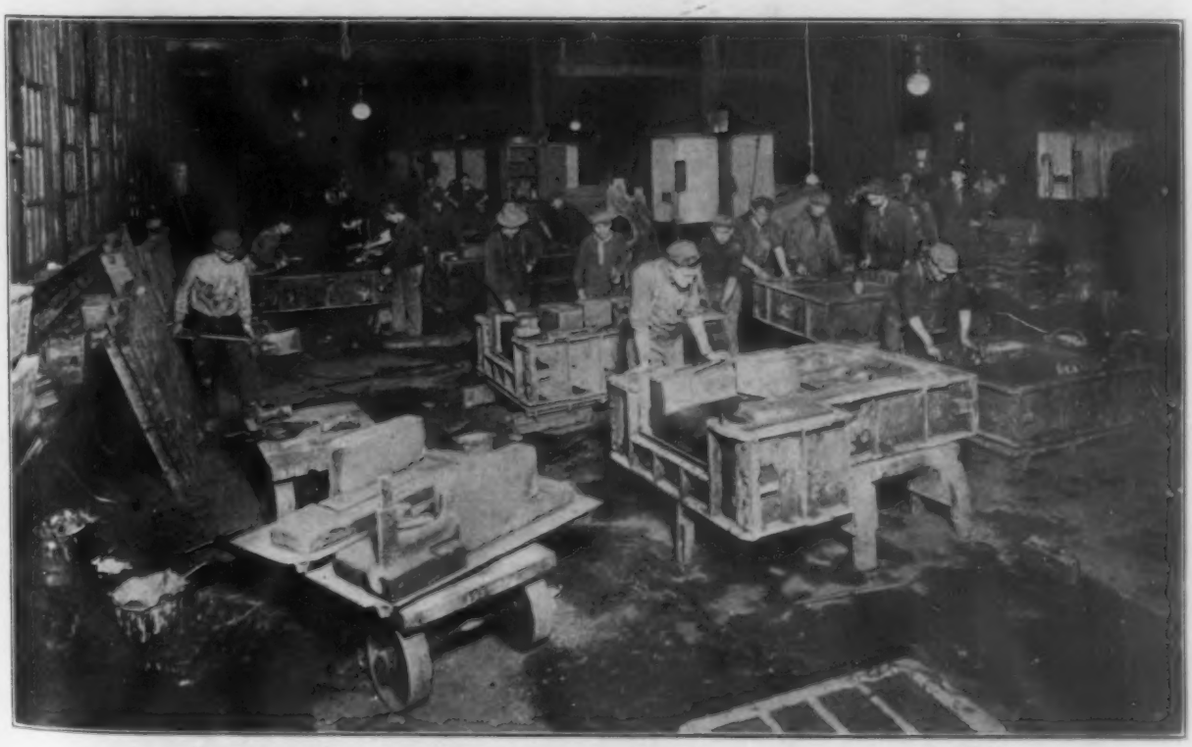
necessary in making the man and dealings with him the subject of this address.

APPRENTICESHIP

At this time, when foundrymen as well as those having the management of other lines of industry are asking, "Where are the skilled workmen? How can we supply the need?" it is well pointedly to inquire, "What are you doing to-day to provide for this need in the future?" I believe that there is only one answer to this question and that is that every foundryman should be training young men through apprenticeship to learn the various branches of the business as distinguished from men who are hired as operatives simply to perform one operation in which in a short time they can become reasonably skillful, but which does not fit them for responsibility in the trade. I know the thought which comes into the minds of many: "It costs more than the returns we get. It takes the time of experienced men to instruct 'green' boys, and as soon as we have one trained he leaves and goes somewhere else."

It is believed that a systematic plan of apprenticeship, entered into seriously, with terms just to both the employer and the apprentice, and with sufficient guidance and backing from the management, will bring results which will offset the objections just pointed out and that, as a consequence, the whole trade will profit from the results obtained. A conference board on apprenticeship composed of representatives from several of the leading national organizations is now working on this problem.

At the foundry of the Brown & Sharpe Mfg. Com-



This View of the Brown & Sharpe Foundry Shows the Type of Metal Flasks in Use

pany the course of apprenticeship for molders occupies three years, the ages at which boys are taken to learn this trade being 17 to 20 years. They are paid 14, 16 and 18c. per hour during the apprenticeship years. The apprentice pays $25 at the close of the trial period as a guarantee of good faith, or it might be considered as a payment for the privilege of learning the trade. At the successful completion of his term of apprenticeship he is paid a bonus of $100. These apprentices are given experience in bench work, floor work and in the core room. They also have, during working time, two hours per week of school work, devoted to subjects related to their trade and tending to increase their efficiency. This school work consists of simple mathematics, based entirely on foundry problems and having to do with the sizes of flasks, weight of iron poured, etc. The course also includes reading lessons in connection with foundry practice and methods.

Apprentices are also taken in the core-making department for a period of one and one-half years, the rates of pay for the successive periods of six months being 14, 15 and 16c. per hour. In this case $25 is paid by the apprentice at the close of the trial period and a bonus of $50 is paid to him at the successful completion of his apprenticeship. In both these forms of apprenticeship the boys have piece work or job work during a considerable portion of their time, so that those who are efficient can earn materially higher wages than the scheduled rates.

Pattern-making, so closely allied with foundry work, also has its apprentice system, these apprentices serving for four years and being given some experience in the foundry during the course of their apprenticeship.

While a fair proportion of these apprentices remain after completing their time, it is not felt to be wholly to the disadvantage of the company to have good men go out to other foundries because, as in the case of machinist apprentices they often become missionaries to make the name of the company widely and favorably known in a way to turn business later to the home shop. In many cases these boys, even when they leave for a time, return later to become valued workers for the company.

Some time ago I heard Clarence H. Howard of the Commonwealth Steel Company say that when he went to take charge of that plant the first thing he did was to give attention to the boys, getting them together, becoming acquainted with them, and putting the stamp of his personality upon them. He took pains to impress upon them that the future managers and skilled workmen of that business were to be selected from among them and that it was worth their best efforts to fit themselves for such positions.

SANITATION AND HEALTH

After securing and training our men, an important duty of the management is to see that proper provisions are made for their comfort, health and safety. These matters often become factors in determining whether men will stay or leave, and sometimes have a deciding influence rather than the question of pay.

Among the most important matters to consider are the provisions for an ample and pure water supply and clean and ample wash and toilet rooms, with lockers or other suitable provision for clothing, so separated from the smoke and grime of the foundry as to preserve the workmen's self-respect when he changes his clothes to go on the street. Shower baths in connection with this equipment are important adjuncts. [It was brought out later by questions from the audience that at the Brown & Sharpe foundry the men's clothing is dried by steam pipes under the lockers and during the winter by direct circulation of hot air; that there is one shower bath for each 20 workmen and that they are generally used, and that the men are not permitted to leave the foundry with unwashed faces and hands, under penalty of dismissal.]

Core Room of the Brown & Sharpe Foundry

Securing adequate light and pure air are especially difficult problems in the foundry and require consideration at the time of the construction of the buildings. Successful provision along these lines, with some method of properly controlling the temperature, should have much to do with comfortable working conditions.

While the important consideration is to keep men well, provision for caring for them when ill also has its place. Here the service of a first aid department and a shop dispensary, where a skilled physician and experienced assistants are in attendance, can help cases of acute illness arising in the foundry and keep men at work who might otherwise be out on account of sickness. Such a service can also diagnose cases which may threaten to become more serious and so help them as to avoid the consequences which might follow neglect.

For many years a relief association conducted by the workmen with the co-operation of the Brown & Sharpe Mfg. Company has paid sick and death benefits which have been of material aid in "bridging over" in

times of greatest need. A co-operative investment and insurance plan is also being put into effect.

SAFEGUARDING

The first aid and dispensary equipments are also of direct help in case of accidents. The important consideration here, however, is to prevent accidents by the safeguarding of all points of danger and the instructing of the men in safe methods of work.

In the Brown & Sharpe foundry much attention has been given to this matter of accident prevention. At times the company has felt that it was making great gains in reducing such accidents, but with the present congested condition of business and the necessity of hiring a large number of inexperienced men there have been periods of relapse when it has seemed impossible to keep down the accidents.

It was thought at one time that the combination of wearing congress shoes, inspected periodically to see that they were in good repair, together with leggings coming over the tops of the shoes, would almost eliminate burning accidents to the feet. An early form of legging which was used proved quite efficient in this respect but, owing to its being attached by buckles, the process of removing it was found to be too slow when a burning accident did occur. The N. A. S. O. legging was then substituted, a form with which foundrymen are now becoming familiar through the fact that the National Founders' Association is represented on the board which is working to standardize matters of safeguarding. This style of legging snaps on the leg in such a way that it can be readily removed in case of burning. It has, however, the objections that it easily rises above the shoe tops, especially after becoming a little worn, or when used by a long-legged man, and burning accidents then occur, the hot iron entering at the top of the shoe. The use of a chain passing under the foot to hold the legging down in place is being experimented with, also the making of leggings of varying lengths to suit the workmen. It is hoped that some still better method than any so far suggested may be brought to light, one which will entirely prevent these painful and slow-healing burns.

THE DRINK QUESTION

The encouragement of sobriety and the securing of a sober class of foundrymen are direct factors in the promoting of health and the avoiding of accidents. A remarkable movement is now going on throughout the industries to eliminate the drink evil and I believe it will be found that, when normal conditions are restored —following the present situation where the demand for labor is so great that it is felt that some things must be "winked at" which ordinarily would not be tolerated —it will mean a still further elimination from the industries of those who are subject to the drink habit— this as a protection to the manufacturer against the enactment of compensation legislation, etc., and because of a growing conviction that the drink evil is a menace to efficiency.

Following strong resolutions along these lines passed by the National Safety Council at its annual convention, the efficiency journal 100 *Per Cent* said editorially: "We congratulate the National Safety Council on its stand and trust that these resolutions will develop into a real campaign. Liquor does not mate with clear thinking, presence of mind, keen perception, careful or skillful manipulation of machinery, nor does it promote prosperity and self-respect. Either liquor or efficiency must go, and efficiency is here to stay."

TEACHING ENGLISH

A new labor problem comes from the bringing together of many nationalities, a much larger proportion of workmen than in the earlier days coming from countries where English is not the native tongue. This introduces not only misunderstandings resulting in spoiled work and lowered efficiency, but also in an increased accident rate and loss of time from sickness. Under these circumstances there is not the common ground of interest which formerly existed.

One step toward bringing about a better condition in this respect, which the foundryman can well consider a part of his legitimate work, is in taking such measures as are possible to teach the rudiments of English to workmen who need such instruction. The fact that it is often the workmen who need it the most who are least responsive and require the most pressure to make them get the benefit of such teaching, makes the problem the more difficult. Coupled with this, it is desirable to have these foreign-born workmen interested in becoming American citizens and in identifying themselves with our institutions if, as is usually the case, they are to make their homes and bring up their families here.

It very easily becomes a habit, however, for foremen and fellow-workmen to treat this class of employees as mere numbered units in factory production, without giving any thought to the fact that they are human beings, and it is believed that this is one of the important reasons for some of the serious labor troubles which have occurred. A little pains taken to get the workman's point of view and make him feel that there is a human interest taken in him and his welfare will, it is believed, largely overcome this feeling. It is important, however, that such dealings shall not be along paternal lines in a way to make the workman feel that he is being exploited.

PRESENT ABNORMAL CONDITIONS

The whole labor question is seriously complicated in these days by abnormal conditions, starting with the rush for munition work where, in such centers as Bridgeport, the need of workmen became so great that many concessions were made to build up new industries and to keep others going, regardless of the influence on the future, and thus paving the way for the serious labor troubles which have been affecting not only New England but the whole country. A recent illustration is found in the threatened strike on the great railroad systems and the stepping in of the National Executive and Congress to legislate so as to avert the strike, but in a way such as many of us believe will not permanently solve the problem but will simply encourage more serious disturbances as time goes on.

In recent times some investigations have been made to ascertain the cost of "hiring and firing" employees. All such investigations have shown that the cost is much greater than is commonly believed. Also, that when the figures are worked out it is found that a much larger number of new employees are hired to maintain the force in a given year than should be necessary. With a true appreciation of the cost of this constant shifting of force and an earnest effort to remedy the difficulty, it is believed that not only the workmen themselves will be better off but that the standard of efficiency in our American foundries will be materially raised.

Time Required for Steam-Hydraulic Forging

The time required for forging billets in the steam-hydraulic press is given in an article by A. Myslin in the *Uralian Engineer*, abstracted in the *Journal* of the American Society of Mechanical Engineers of September, 1916. The steam-hydraulic process of forging is compared with the purely hydraulic process from the point of view of power consumption per unit weight of output. The investigation upon which it is based was made on a 90-ton hydraulic press, working with an accumulator, and having a daily output of about 17 tons of plates, and on a 5000-ton steam-hydraulic press whose daily output was 35 tons of 6-in. shells. The shells were made from a billet forged to an octogon section from an 1800-lb. ingot. The time study given below was made on this latter operation.

	Min.
1. Withdrawing ingot from furnace, conveying it to the press and locating it for forging	1.5
2. Forging	10.75
3. Straightening	3.5
4. Time lost between completion of (3) and the beginning of (1) on the next succeeding ingot. NOTE.—During this time some of the men remove the billet from the press and convey it to the sand bath.	1.5
5. Changing hammer heads and falls and tightening them up (average per forging)	5.0
6. Time lost due to crane trouble (average per forging)	0.5
Total time for forging one ingot under normal conditions	22.75

NEW ANNEALING FURNACE

Employs Surface Combustion with 580 B.t.u. Gas—Articles Treated Uncovered

Two annealing furnaces are now in operation at the plant of the Remington Arms Company, Eddystone, Pa., employing the surface combustion principle and giving a neutral or reducing atmosphere which makes it possible to treat the forgings without packing or otherwise protecting them against possible oxidation. The surface combustion system of utilizing gaseous fuel, discussed in THE IRON AGE of Dec. 7, 1911, and of Feb. 8, 1912, involves the delivery of the gas against or through refractory material, with the result that the surface of the incombustible material becomes and remains incandescent. The present installation was designed and installed, under patents granted to Prof. Charles E. Lucke of Columbia University, by the Surface Combustion Company, 30 East Forty-second Street, New York.

The furnaces were provided for annealing rifle parts immediately after forging. The furnaces, two in number, are of the car-bottom type. They are 20 ft. long, 12 ft. wide and 9 ft. high. The charge to each furnace varies from 20,000 lb. to 40,000 lb., depending upon parts handled.

The surface combustion high pressure system, it is claimed, inspirates all the air necessary for complete combustion and maintains automatically constant mixture proportions without motors, blowers or air piping. It is controlled from a central pulpit.

A mixture of water and coal gas, averaging 580 B.t.u. per cu. ft., is supplied by the Philadelphia Suburban Gas & Electric Company, Chester, Pa. The gas is delivered and metered under a pressure of 25 lb. The gas is metered by a rotary pressure meter and a Bailey flow meter.

During the heating up period, each furnace consumes about 10,000 cu. ft. of gas per hour. When temperature has been reached, this is dropped to about 5000 cu. ft. per hour. For a maximum weight charge, approximately 72,000 cu. ft. of gas is used by each furnace. Two charges per furnace can be secured per 24-hr. day. Cost of gas in this case is based on a sliding scale rate. The approximate average rate for this work is 43 cents per 1000 cu. ft.

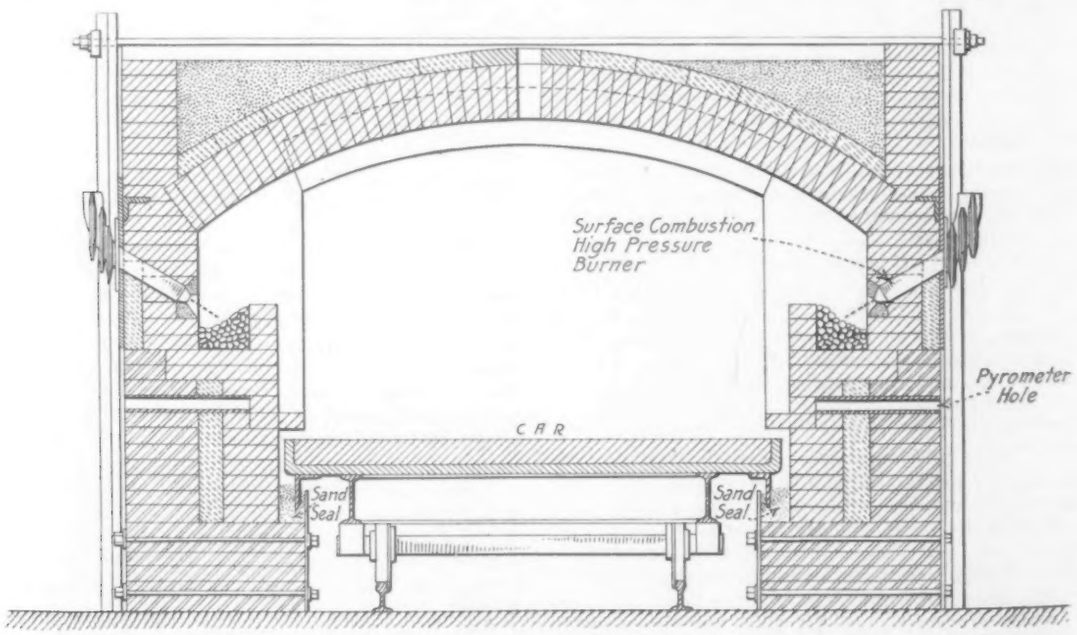
The temperature of the anneal is 1550 deg. Fahr. The time of the operation is as follows: The charge is placed in the cold furnace, fuel is turned on full until the furnace has reached correct temperature. The time it takes to reach the temperature varies with the weight of charge. For a 40,000-lb. charge, it takes about 5 hr. After the temperature has been reached it is held for 4 hr. to allow the heat to soak into the work. After this 4-hr. soak, the fuel is turned off and furnace is allowed to cool slowly, the work not being taken out until a temperature of 400 or 500 deg. Fahr. has been reached.

A flat car, with a fire-brick top, serves as the bottom of the furnace when in place. This car affects a seal with the furnace walls by means of a sand seal. Two cars are used in each furnace, meeting at the center. Each furnace has two doors which, when closed, rest on top of the cars, the cars themselves extending out beyond the furnace walls about 6 in. The cars ride on rails which run right through each furnace and extend about 20 ft. beyond in both directions. The cars are handled by winches, and the doors are operated by air hoists.

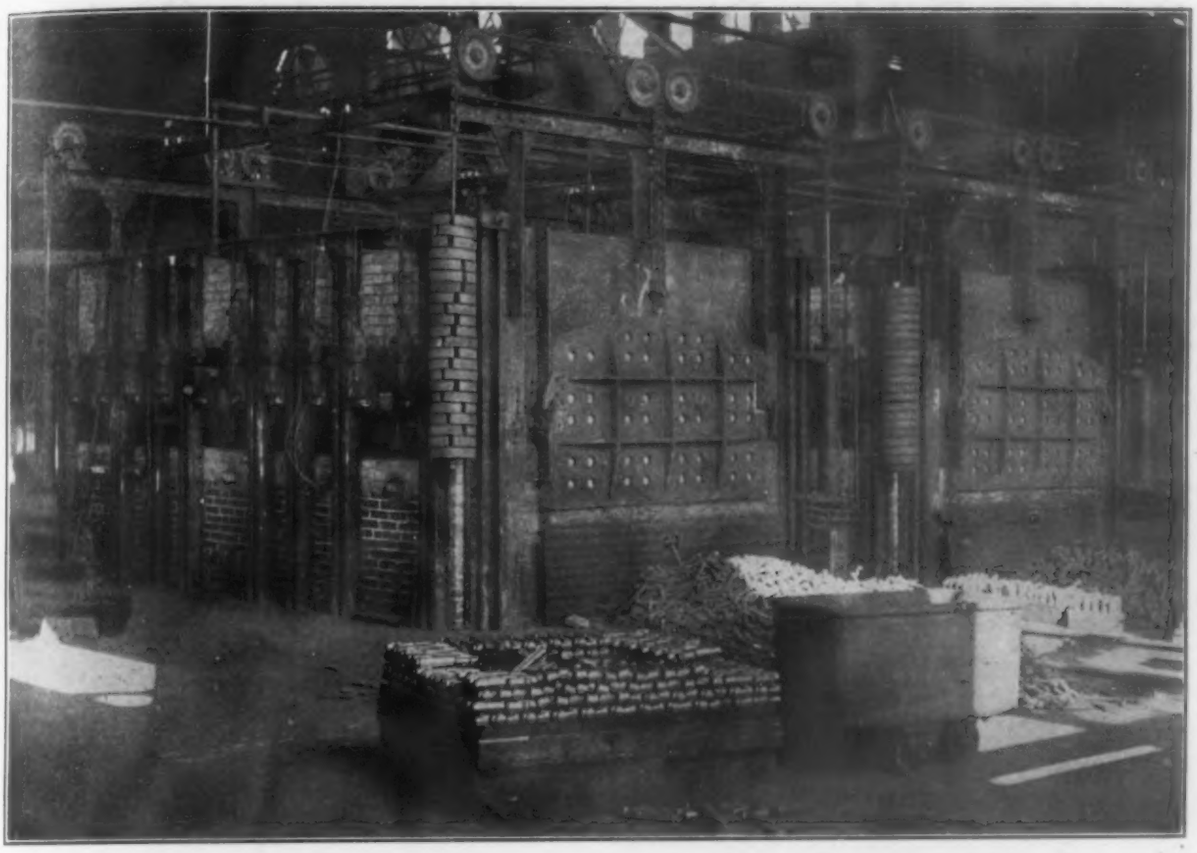
The furnaces are of the heavy-rail-buck-stave type with red brick outside. The firebrick lining is backed up by cork-brick insulation. Heavy tie rods tie the buck staves both across and end to end. To prevent leakage of cold air in, giving an oxidizing atmosphere and lowering the furnace efficiency, a furnace back pressure is carried, the flue openings being adjusted to a size to get this condition. The furnaces are designed to develop and utilize the maximum possible amount of radiant heat, and the flues are arranged to distribute the hot gases uniformly and to release them at the lowest possible temperature. Each furnace is equipped with 20 surface combustion high-pressure burners.

Both furnaces are controlled from a central control point by a single valve which regulates the pressure supplied. By raising or lowering the pressure, the gas supplied is increased or decreased, thereby raising or lowering the temperature. All pyrometer readings are also taken at this point from a multiple point indicating instrument. Four couples are located in each furnace, one in the center on each side of each car. A small amount of a man's time suffices to hold the furnaces to the exact temperature called for. The temperature control is found to be accurate.

Readings on an orsat apparatus have shown neither oxygen nor carbon monoxide and an average of 15.2 per cent carbon dioxide. This shows that there is no excess air and no unburned gases. When the furnaces were first put into operation, it was planned to pack the rifle parts in large steel boxes with covers sealed with clay. This was to prevent oxidation. Believing that an absolutely reducing atmosphere could be maintained, which would produce a minimum of scale, a trial was made, simply stacking the parts, uncovered, on the car top. The trial was successful and the operation



The Refractory Material in the Trough at Each Side, Kept at Incandescence by the Series of High-Pressure Gas Burners, Radiates Heat to the Furnace Roof and Thence to the Material on the Car, Which Forms the Furnace Floor. The material treated is not covered



Angle View of Two Surface Combustion Furnaces in Works of Remington Arms Company. Control point can be seen in center on right. Bottom of door rests on top of car. To keep cold draught from circulating under cars, metal shields are placed over opening. The high-pressure burners can be seen on the side of the near furnace

has since been handled in this way. To maintain this reducing atmosphere the mixture is adjusted to give a flue gas reading of about 1.2 per cent carbon monoxide.

The furnaces were installed in competition with fuel oil costing 4½ cents per gallon. Several oil-fired furnaces of practically the same size and doing the same work were in operation prior to the installation of the surface combustion furnaces.

SAFETY IN STEEL WAREHOUSES

Joseph T. Ryerson & Son Conducting Contest—Method of Rating and Making Awards

To promote interest in safety and keep accident prevention foremost in the minds of their employees, Joseph T. Ryerson & Son, Chicago, New York and St. Louis, are conducting a safety-first contest modeled after the Dodge plan. The plan is as follows:

Records are based on fewest number of accidents which cause days lost after the day on which the accident occurs, and also on the fewest number of days lost after the day on which the accident occurs.

A standard of 1000 points is set for perfect record. To attain this record, workmen or department must have no accidents causing the loss of full days.

For each accident causing full day's absence after day of accident, a number of points is deducted from 1000, equal to the ratio of one man to the total number of men in the department. For instance, in a department with 100 men, this will equal $1/100 \times 1000 = 10$ points.

For each day lost on account of accident after the day of the accident, a number of points is deducted from 1000 equal to the ratio of one day's time to the total number of days all men work in the department. For instance, in a department of 100 men working 25 days per month, or a total of 2500 working days, this will equal $1/2500 \times 1000 = 0.4$ point.

No department, however, will be penalized for more than 30 days' lost time on any one accident.

For fatal accidents, or accidents causing loss of fingers, toes, limbs, eyes, or permanent disability, a penalty of 30 days' lost time is charged in the month the accident occurs.

After all penalties for accidents have been deducted from 1000 and all penalties for days lost have been deducted from 1000, the two remainders will be added and divided by two. After the results have been considered, the rewards, based on the records, are made as follows:

The department having the highest record in a month is given the guardianship of a prize pennant, hung on exhibition in some suitable place, to be held by it for one month.

All men who have worked one year in the department which for the year maintains the highest record are rewarded by 16 hours' time off, with full pay, equal to a Friday and Saturday.

All men who have worked in that department less than one year, but nine months or more, are rewarded with 10 hours' time off, with full pay.

All men not working in the winning department, but who have a record of 1000 points for the year, not having had an accident which caused a full day's loss of time, will be rewarded by 16 hours' time off, with full pay.

The rewards are made by either time off, as described above, or its equivalent in wages, whichever the management decides.

Foremen of the winning department for a month are rewarded by an addition of 5 per cent to their monthly bonus, or, if they have no schedule, of 5 per cent of their monthly wages.

The foreman of the department which wins the annual prize is rewarded by a prize to be chosen by the executive committee.

The contest, which is open to all workmen, lasts for one year, ending May 31, 1917. In addition to the ordinary methods of accident prevention by means of safety guards on machinery, warning and instruction signs, safety bulletin boards telling of accidents and how to avoid them, letters inclosed in pay envelopes, etc., the company has created committees to supervise, suggest and assist in making the plants safe. There are three committees—executive, central and departmental. Each departmental committee is composed of a foreman, a Betterment Department representative and two members of the department, the last two being changed every month so that all employees have a chance to serve. Inspections of machinery are made every week.

The Atlantic Steel Company, Atlanta, Ga., reports its net profit in August, $116,921. Gross earnings for eight months were $574,718; reserve interest dividends and replacements, $191,750; net, $382,968.

Quebec Bridge Disaster Charged to Casting

One of the Four Cast-Steel Bearings Supporting the 5000-ton Span While Being Lifted Into Place Believed to Have Collapsed

THE failure of one of the cast-steel bearings through which the weight of the 5000-ton span of the Quebec bridge was transmitted to the lifting girders in the operation of raising the member from floating scows to its permanent position is given as the cause of the disaster which befell that structure on Sept. 11. The scheme of erection comprehended lifting by means of hydraulic jacks. The span was carried at each end by a cross or lifting girder to which were attached the heavy so-called chains made up of 30-ft. articulating lengths of steel plates. As the bearing for the span on each girder were two groups of steel castings, one group toward each end of the girder. Each group was designed as a rocker joint to allow movement about the transverse and longitudinal axes of the bearing.

The detail of the rocker-joint bearing is indicated in Fig. 1. The main features are three steel castings and two forged pins. The latter are at right angles to each other and, with the castings, form a universal joint. The photograph does not represent the detail as it was when the span was being hoisted. Previous to floating, and after this photograph was taken, two hitch connections were added. These hitch connections carried the lifting girder when the span was being floated up the river to the site of the bridge. Then when the span was on the barges, centering plates were added to insure the absolute centering of the lifting girder on the bearing when the load of the span was transferred to the hoisting chains. These plates were shop-fitted and bore against a chipped surface on the arm *C* of the intermediate casting. A black streak at *D* shows where the chipping was done in one of the angles of the casting. The plates and castings were match-marked to make it impossible to put them in place until the girders were accurately centered on the intermediate casting. Once in place they prevented movement in a direction parallel with the length of the span.

That the rocker-joint bearing of the southwest corner of the span was responsible for the failure is the firm conviction of the *Engineering Record*, which finds that the span did not slip from the hanger, and that the conditions of damage on the lifting girders point to a collapse in the bearing.

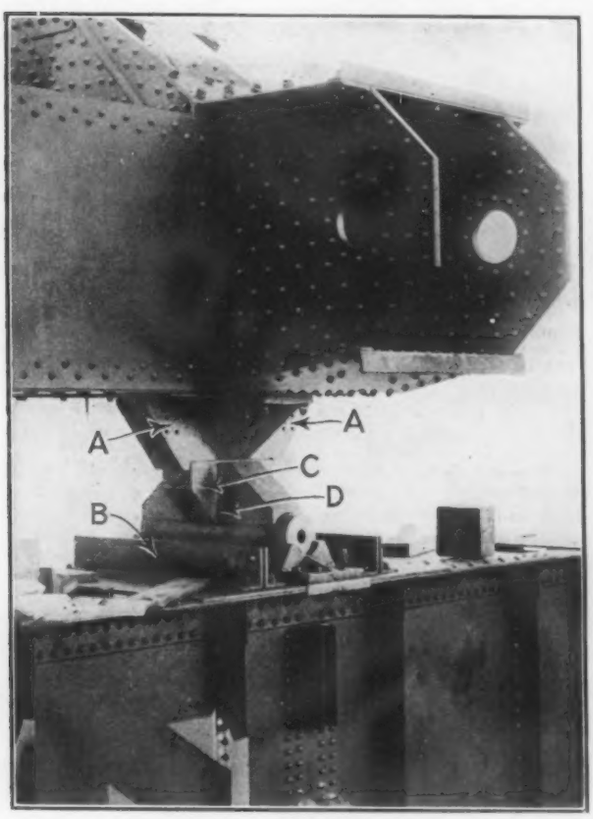


Fig. 1—Rocker Joint Bearing Transmitting Load of Span to Lifting Girder

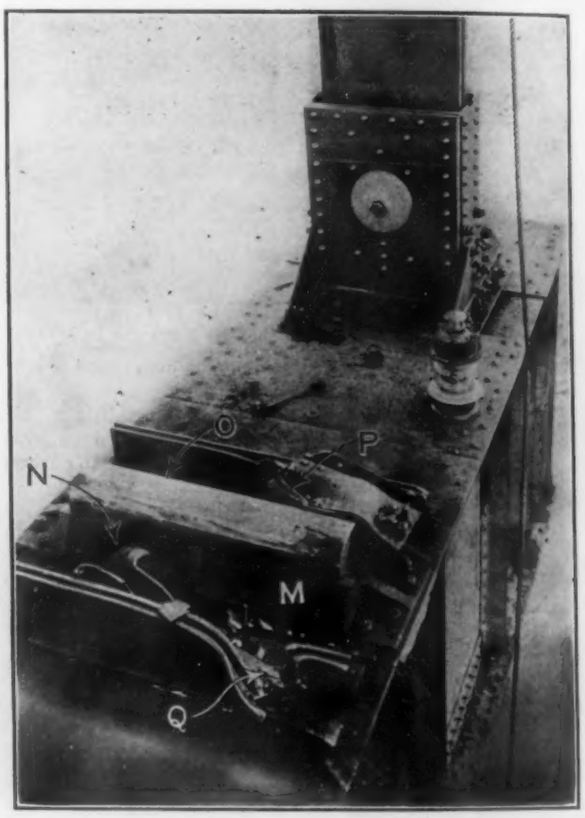


Fig. 2—The Southwest Bearing of the Span After the Failure

The condition at the southwest corner after the span had fallen is shown in Fig. 2. The picture was taken looking in a southwesterly direction. In other words, the face of the girder shown is toward the channel, while the hanger is the westerly, or upstream, one of the pair. It will be noted that the centering plate that had been bolted on at *M* has been sheared off. The plate attached at *N* is ripped loose and lies twisted in front of its former position. The plate that was at *O* has disappeared, while the remaining plate *P* lies crushed against the pin, with the hitch connection of that side lying over it. The pin is scored in a diagonal direction, and has been rotated through a circumferential distance of 1½ in. toward the reader.

It is certain from this photograph, the *Engineering Record* holds, that the span did not "dip" off the pin. If it had, the plate *P* would have disappeared, the scoring of the pin would not have been diagonal, the pin would not have been rotated, and the damage to the angles at *Q* would not have occurred. In no way, it believes, except by the falling of the span through the breakage of one of the castings or of a pin above, could the damage have been wrought. The failure of a pin is

unlikely. Something broke and precipitated the span outward toward the river and toward the longitudinal axis of the structure. The angle of movement was about 30 deg. with the bridge axis, as is indicated by the break at *Q*, the scoring of the pins and the position of the hitch connection resting on the plate *P*.

The southeast lifting girder is shown in Fig. 3. The view is taken from the channel side looking eastward, or downstream. It will be noted that the centering plates are, all four, still bolted to the lower castings. All of them are flared outward, while the one nearest the reader in the view has been battered down in the crash. The pin shown, the *Engineering Record* says, is the shorter tranverse pin which carried the load from the upper to the intermediate casting. The explanation is that the falling of the southwest corner twisted the southeast corner of the span in a counter-clockwise direction (looking at it in plan) and at the same time carried it in a clockwise direction, considered in a vertical plane parallel with the lifting girder. The counter-clockwise movement accounts for the flaring of the plates. This movement, it is believed, also explains how the transverse pin came to fall into the longitudinal bearing, after the longer pin had disappeared. The shorter pin was probably not thrown about through a right angle but probably to a less degree. Caught by the flaring plates, it was directed into the place of the longer one.

The cantilever arms and anchor spans of the bridge are untouched. The hoisting equipment, it is added, has been proved entirely adequate and the design of the hoisting apparatus has been fully vindicated. In consequence, the St. Lawrence Bridge Company, contractor for the structure, has determined, it is understood, to proceed at once to the building of a duplicate span and to its erection by the identical method.

Engineering News also finds that the bridge first smashed down through the southwest supporting rocker and then skidded diagonally off this seat as the hanger was kicked backward southwesterly, and that subsequently at the three other supports it twisted or pulled away. That journal describes the rocker joint bearing as follows: On the top of the lifting girder there was a steel shoe casting with a longitudinal pin groove, carrying a 9½ x 46½-in. pin parallel to the line of the bridge. On this pin was seated the suspected steel rocker casting, which in turn carried a short transverse pin, 8 x 26¾ in. The upper shoe, attached to the base of the end post of the span, rested on this transverse pin. This detail served as the universal joint needed during the five weeks that the suspended span stood on its end supports, awaiting the day of floating and hoisting.

Something must have broken in the northeast quarter of the shoe detail, *Engineering News* says. It could have been only the intermediate or rocker casting. The fracture most probably occurred near the root of the front lower pin-bracket of this rocker, putting the bearing on the lower pin out of service; and in all likelihood the fracture entered the upper pin seat and one of the upper brackets also. Concentration of the 1200-ton load on the fracture edges must have caused crushing, tipping of what was left of the rocker, and some backward movement of the lower shoe and lifting girder.

It was incidental to this quickly-passed stage of the catastrophe that the westerly fragment of the rocker bore down on the two west centering plates, curling one of them over and forcing the other off by downward shear. In the same action, however, the fragments of the broken rocker were ejected from between its two pins like a smooth wet orangeseed, and, the impulse kicking back the entire swinging girder, the corner of the span fell free, only grazing the pin and the girder cover-plate as it went off.

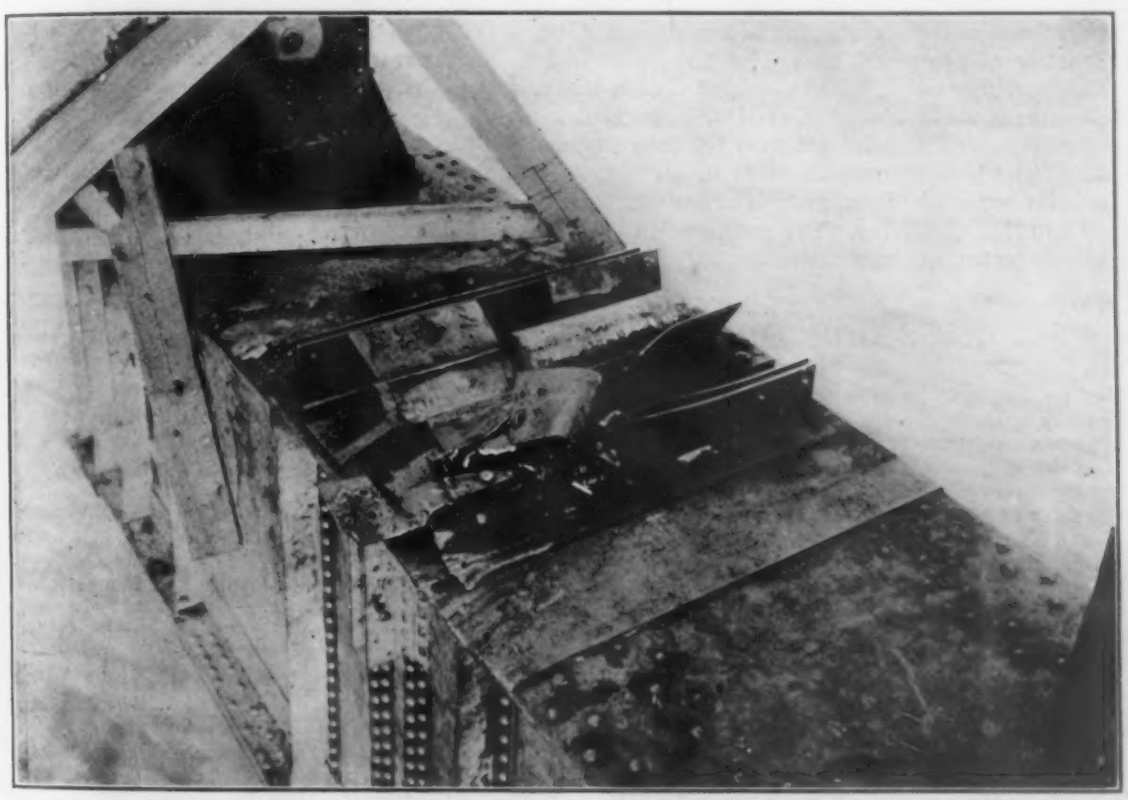


Fig. 3—Flared Centering Plates on Southeast Corner Are Taken to Indicate that Intermediate Casting Rotated in Going Off, Leaving Transverse Pin in Seat of the Longitudinal Pin

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The Cohen-Schwartz Iron & Steel Company, St. Louis, Mo., is fitting up new yards adjoining its old location and expects to have everything ready for business by Oct. 1. The most modern and approved machinery is being installed for handling and preparing scrap. The plant covers about 12 acres and has six siding tracks and two spurs, capable of accommodating 75 cars at one time. The company also announces that it has opened a branch office in the Oliver Building, Pittsburgh, Pa., for the purchase and sale of scrap iron, steel and metals, under the management of S. W. Platt, formerly manager of the Pittsburgh office of the Canton Iron & Metal Company.

New Foundry Trade Advance at Cleveland

Uniform Cost System to Become Operative—Electric Steel, Molding Sand and Malleable Castings the Leading Features of Discussions

The Cleveland convention of the American Foundrymen's Association and the contemporary meeting of the American Institute of Metals were carried through the week of Sept. 11-16 with the record-breaking momentum of many notable achievements. The attendance was remarkable. An approximate registration of 1100 included 888 members as compared with 513 in 1915. The long-sought roll of 1000 members was reached and then exceeded by a good margin through a surprising influx of applications.

The attendance at the several technical sessions was by far the largest ever seen. The amount of discussion and its keenness, while due in part to the numbers present, must also be credited to the fact that the papers treated largely of general problems incidental to the foundry business as it is in any shop, so that many present were able to offer profitable suggestions despite the conditions of impromptu discussion.

The 1916 meeting, the twenty-first of the association, also marked the beginning of its career as a corporation conducting its own associated exhibits. The number of exhibitors and the excellence and diversity of equipment shown, as already published, were paralleled by the record of efficient and harmonious management of the exhibit under the new auspices.

The arrangements by the Cleveland committee for plant visitation, entertainment and the annual banquet gave a well rounded program for each day, and the smoothness of its execution was a matter of comment. The banquet was an event of distinction, and the American Foundrymen's Association may well base its hopes of future growth and attainment upon the type of ideals and of enterprise that gave character to that gathering. The presentation of a chest of silver to R. A. Bull, the retiring president, impressively reflected, in the manner of its giving, the animating spirit of the occasion.

Sessions on General Foundry Practice

Brief mention was made in the issue of Sept. 14 of the Tuesday morning session at which, as on Wednesday morning, subjects common to gray iron, malleable and steel foundries were considered. President R. A. Bull presided on both days. In the symposium entitled "The Results of Closer Co-Operation Between the Engineer and the Foundry," the principal point of the paper is again worth emphasis, namely, that foundry management must strive toward a fusion of the viewpoint of the engineer who designs the casting with that of the practical foundryman who makes it. Each must be brought to a better understanding of the other's methods and equipment and of the consideration which each has to take into account. It was pointed out by D. W. Sowers, Buffalo, N. Y., that this co-operation is needed much more often than it is practised even in the case of what may be termed "plain work." He cited especially the precautions necessary to be taken in the molding of castings having machined surfaces so that, for example, chills when used will not conflict with later machining or so that the cleaning action of the metal as it cools will not bring to the finished surfaces the impurities which might have been disposed of otherwise by a different method of molding or pouring. The importance of the statement, in the paper of John Howe Hall, referring to faulty specifications, correct alloys and elastic limit, is such as to call for its publication in greater detail elsewhere in this issue. The excellent presentation by C. E. Chase of the functions of the engineer in respect of the non-ferrous metal foundry likewise warrants a more detailed report than space here permits. As an engineer Mr. Chase laid special stress on the fact that the engineer is now profiting in a degree heretofore impossible because of the growing tendency among plant operators to exchange practical information and experiences directly or through the medium of technical associations and the trade press, and to get away from the idea of hoarding "trade secrets." He urged upon the practical foundrymen the self-interest promoted by interchange of this kind.

The discussion of this symposium recognized the inevitable approach of a period of competition, more keen and extended into wider markets than ever before experienced, with success depending upon a collaboration between engineer and foundryman which will insure correct designs, minimum costs, a knowledge of what is to be done before manufacturing begins and a higher plane of efficiency.

The treatment of the "Influence of Gating on Castings" was also referred to in the issue of last week. It was stated by B. D. Fuller of Cleveland that nothing so indicates the mechanical ability of a molder as his method of cutting a gate.

THE RECLAMATION OF SAND

The paper by H. B. Swan, Detroit, relating to "Waste Foundry Sand," introduced what was this year as it was at Atlantic City a topic of the greatest interest. Mr. Swann's paper set down a résumé of conditions existing at a large number of foundries as applied to the reclamation of sand, based on answers received to a questionnaire. The wide divergence in replies on the one hand and on the other the economies that are being effected in some instances indicated the opportunities of improving conditions. The importance of sand reclamation is, of course, especially pronounced in the case of foundries unfavorably situated. Foundries whose sand costs them $2.25 or less are not so much concerned. In the case of a New England foundry, whose cost for good Jersey sand averages $3.25 per ton, to which must be added the 50 cents per ton involved in waste and disposal, the matter is of greatest importance and excellent results have been obtained by the use of mullers for intensive mixing. Following a period of experiment at this foundry it was found that the amount of new sand required in a certain facing had been decreased four tons per day, or about 40 per cent. A core sand mixer, formerly containing new sand and flour representing a cost of $1.10 per ton, is now made for 27 cents per ton; the new sand and flour are entirely omitted, a small percentage of clay replacing both. The saving was effected through securing a more intimate mixture.

R. F. Harrington, in relating the above experience, expressed the opinion that while clay may replace the new sand to a considerable extent in certain mixtures, it must be used judiciously in order that the facing

may not become too close. It was stated in Mr. Swan's paper that the cost of disposing of used sand ranges from 30 cents per ton to as high as $1.50 per ton. Much of this expense, he shows, may be avoided by working over the used sand. It was further stated that "in attempting to use burned sand in new core-sand mixtures the cores are weak, soft, require an excessive amount of binder and do not resist the action of the metal well." Where sea coal has been used either in facing sand or in the core sand mixture it becomes coked and it is impossible to wash it out.

THE ESTABLISHMENT OF STANDARDS FOR SAND

The above paper and its discussion were associated with the following paper, a report of the work of the United States Bureau of Standards with reference to molding sand. This report was prepared by Director Stratton and in his absence was presented by C. P. Karr. Reference was also made in the discussion to the report of the committee of which Dr. Moldenke is chairman and which is co-operating with the Bureau of Standards in the investigation of molding sands. Mr. Karr presented results and data of experiments already conducted in the sizing of sand and the determination of melting point. The objects toward which these investigations are being directed include:

1. The creation of a standard sand available to the trade generally, with which any sand may be compared and its proper place in a scale of desirability determined.
2. To have this standard sand represent as nearly foolproof qualities as possible, i.e., to be capable of being rammed hard, yet retaining sufficient venting power to give good results.
3. The standardization of melting point, especially for facings for steel castings.
4. The standardizing of sieve mesh sizes and a better nomenclature for sands graded by screening.
5. With reference to sand reclamation, more complete information regarding the bonding values of clays.

It was shown by Dr. Moldenke that the tendency was clearly in the direction of preparing an artificial molding sand for use as a standard, available knowledge as to the desired qualities of a good sand now being sufficient. In this tendency we should but be following European practice. In the matter of a melting point requirement for steel facing sand, Mr. Karr recommended that specifications call for a melting point of 1650 deg. Cent., detailing the experiments recently made in determining the fusing points of sand.

To aid the bureau in the establishment of standard screen meshes upon which depends the value of any grading of sands by size a resolution was adopted authorizing the executive board to urge the adoption of such a standard. To further the investigations with reference to the bonding values of clays and the general problem of reclamation a committee was ordered appointed to co-operate with the U. S. Bureau of Mines in a manner similar to that in which the Bureau of Standards Committee is working. Mr. Karr presented detailed data showing the sizing, moisture content, melting point, transverse and permeability tests which have already been made on sands and from which standards for the artificial molding sand may be determined.

HOW SHALL APPRENTICES BE SECURED

The report of the representatives of the American Foundrymen's Association on the Conference Board on Training Apprentices was read by B. D. Fuller, chairman. It outlined the results of the meeting of the board, April 22, 1916, at New York. In the opinion of the board the problem of vocational education is still so undeveloped as to make the enlistment of federal financial aid premature and that for a time the furtherance of such education may better be left to the States.

The discussion called out by this question of apprentices promptly indicated how closely it touches every operating foundry. It was not difficult to see also the different angles from which the problems of recruiting the ranks of the molder is viewed. The practical foundryman sees hope only in the restoration of the system of bound apprentices under which he served his time and a correction of the evil of one foundry stealing apprentices from the other. Those who have engaged in developing the science of founding and of specialization and have been associated with engineering training look to the raising of the esteem in which founding is held as an occupation and as a science to correct the depletion of the supply of molders.

In particular, Dean Connelly, of the Carnegie schools at Pittsburgh, decried the disposition of the foundryman to demean his own business by reference to the working conditions of the foundry. The dean made a plea for support in inculcating the idea in the minds of young men that founding as much as any other trade or art offers opportunity for the expression of individuality and that in its importance in industry it is fundamental. Trained to this viewpoint, young

THE election of J. P. Pero, general superintendent of the Missouri Malleable Iron Company, East St. Louis, Ill., as president of the American Foundrymen's Association honors one who has been particularly active in organizing the men of the foundry for educational and social purposes. In December, 1887, he created the New England Foundry Foremen's Association, the pioneer among associations in the foundry trade, and in 1909 he was responsible for the organization of the St. Louis association. Mr. Pero comes from a long line of founders. Nor will the family tradition cease, since J. P. Pero, Jr., is engaged in the malleable foundry business at Franklin Park, Ill. Mr. Pero was born in Massachusetts in December, 1856, though his youthful spirit and great energy belie the fact. At 14 he entered upon his apprenticeship in a gray iron foundry at Worcester, Mass. In 1875 he left Worcester to begin as a journeyman in the employ of the Chapman Valve Company, where he remained for five years. Subsequently he served as foreman in various foundries of New England, including four years with the Yale & Towne Mfg. Company. In 1888 he first became associated with malleable work, entering the employ of the Malleable Iron Fittings Company, Brantford, Conn., where he was engaged for 10 years. In 1909 he made his present connection with the Missouri Malleable Iron Company. Mr. Pero is of the most progressive school of foundrymen, a student of the metallurgy of cast iron and of founding as an art. He adds a capacity for management and business detail which in the organization of the American Foundrymen's Association has been largely drawn upon, and the sequence of office which brings the senior vice-president of the association to the president's chair was never more happily operative. At no time has the association's outlook been brighter.

J. P. PERO, PRESIDENT AMERICAN FOUNDRYMEN'S ASSOCIATION

men will be less reluctant to enter the foundry. The technical and vocational school and the study of the engineering side of molding in itself are of greatest value in this respect. It would have been a valuable contribution to the discussion could someone have harmonized the viewpoints by tracing the changes in methods of manufacture, showing particularly how the function of the all-around molder has been modified and how the division of labor has logically created the specializing employee.

The discussion also brought up the question of methods of training inexperienced help quickly in order to meet the existing emergency of labor shortage, but little was suggested in this connection. The topic was dismissed with a resolution providing for a committee to draft apprenticeship regulations for submission to the executive board for action.

TO PUT UNIFORM COST SYSTEM INTO EFFECT

The report of the committee on foundry costs, B. D. Fuller, chairman, presented immediately following the opening of the Wednesday morning session, stated that while plans had been considered during the year for putting into effect the proposed methods of cost keeping, conditions had not warranted any actual steps in that direction. The general problem of foundry costs was more fully discussed in connection with the address of C. H. Scovell, Boston. Mr. Scovell brought to the discussion an unusually wide experience as a professional accountant in the work of other associations in establishing uniform cost accounting in the plants of their members. The keynote of his remarks was the urgency for real action to make proposed cost accounting systems effective in the trade. He said that if the American Foundrymen's Association would profit from the experience of other associations in adapting itself to the cost committee's proposed plan, it would engage the services of an expert accountant to visit a large number of foundries to investigate the individual condition under which they are operating, formulating from the data a workable system applicable to all. It is the first essential that there should be a common understanding of what elements enter into cost and in what way each is applied. Mr. Scovell related in detail the experiences of some other associations in their effort to establish uniform cost systems.

Stanley G. Flagg, Jr., pointed out the tendency to indifference to the matter of costs in these abnormal times when the chief concern is to produce the castings, price being secondary. It was emphasized by J. H. Wilson that the two conditions under which cost keeping are especially necessary are those of very good business and very bad business—in the former case because the foundrymen should choose from the excess of work offered him, only the most desirable, a choice impossible without an accurate knowledge of cost, and in the latter case because of the necessity of making the lowest possible price without losing money. Mr. Fuller reiterated the necessity of emphasis upon knowing what individual castings cost instead of quoting on work on the basis of classes of castings. It will be found, he maintained, that some castings are sold for one-half, and less, of their actual cost and also that a realization of the high actual cost of some castings will result in changes in design that will make them cheaper.

In order that the association's propaganda for the establishment of uniform cost accounting may bear fruit, a resolution was offered by Secretary Backert, recommending that the cost committee investigate the plans of other associations and report the results of that investigation with recommendations, within three or four months, to the Board of Directors, who shall be authorized to act. The resolution was adopted.

Part of the Foundry Supply Section in the Coliseum

THE FAILURES OF PROFIT-SHARING

A paper was presented by C. E. Knoeppel, New York, on "Profit-Sharing as a Factor in Preparedness." Mr. Knoeppel briefly abstracted his paper and made the general statement that social and industrial unrest are the basis of industrial unpreparedness. He supported his belief in the need of change in this respect by quoting from Premier Asquith, "After the war there must come a better distribution of wealth between capital and labor." Profit sharing plans will contribute to this end only when they are conceived in a sense of justice and with primary intent of sharing profits with employees. Mr. Knoeppel pointed out that two-thirds of existing profit-sharing plans have been a failure: First, because of the attitude of union labor, which has

not only opposed these plans on general principles, but also because of a lack of understanding of them and because they had no part in their devising; second, because these plans do not take into consideration individual attainment; third, in some cases because of the remoteness of the reward and also, as applied to non-union labor, because of the lack of participation by the men in preparing the plan and putting it into effect. Mr. Knoeppel's paper outlines some proposed profit-sharing plans.

STANDARD SPECIFICATIONS ADOPTED FOR SCRAP

The report of the association's committee on specifications for foundry scrap, published in THE IRON AGE of Sept. 14, was presented by C. E. Jones, chairman. It indicates the manner in which the committee had consulted with scrap users in all sections of the country and in all branches of foundry work before working out the proposed specification. The report presents in detail suggested specifications for cast iron scrap, malleable cast scrap, open-hearth steel scrap, converter, crucible and electric furnace steel scrap. Following a discussion in which were brought out the importance of establishing standards to which foundrymen could adhere and upon which they could insist, in the purchase of scrap, as well as of the desirability of accrediting the specifications thus brought together, the report of the committee was accepted and the specifications adopted as those of the American Foundrymen's Association.

The report of the A. F. A. committee on safety and sanitation, V. T. Noonan, Columbus, Ohio, chairman, was accepted with modifications of the printed text. Chief among the changes was the marking of the subject divisions of the code by letter instead of Roman numerals and the numbering of the sections from No. 1 under each division rather than continuously through the code. The installation of safety devices with respect to equipment was enlarged upon very considerably and many specific references added. M. F. Alexander expressed the hope that some of the provisions of the code might be still further modified.

Section in Coliseum Showing Grinding Machines and Air Compressors

Malleable Founders More Inclined to Publicity

In point of attendance the meeting for the discussion of the papers pertaining especially to the malleable castings industry greatly exceeded expectations. The interest shown was immediately given further impetus by reason of the paper read by F. J. Lanahan, Fort Pitt Malleable Iron Company, Pittsburgh, discussing the use of malleable castings in car construction.

Mr. Lanahan, introducing the subject matter of his paper, endorsed the earlier plea of Vice-President Pero, who presided over the malleable session, asking that in next year's program special prominence might be given to malleable castings through a generous contribution of papers. The castings which enter into car construction have an essential bearing upon the continuous service and ultimate life of the car. The suitability of malleable castings is therefore of special significance, having to do with the fact that they are lighter and stronger than gray iron, smoother and less costly than steel and, while as strong as forgings, also less expensive. But the superior qualities of malleable castings, it was added, are their undoing so far as any ill repute into which they have fallen is concerned, for metal sections are so pared down as often to make their failure certain. Manufacturers have been to blame, who in their ignorance or eagerness to secure business permitted designs to be used from which only castings foredoomed to failure could result. The paper, which will be abstracted more fully in another issue, goes into the merits of malleable castings and details some of the features of design which should be incorporated in the principal car castings. Mr. Lanahan, in conclusion, urged upon the manufacturer that, having a knowledge of what the virtues and the limitations of malleable castings are, he correct the errors of the past and aggressively push for the wider use of his product. He urged the buyer, also, to utilize the founder's experience.

SPECIFICATIONS FOR MALLEABLE CASTINGS

In the absence of changes in the specifications for malleable iron castings in the past year the report of the committee was brief and in the nature of a progress report. It contained the suggestion that the association should seek to anticipate the demands of the car-building, automobile, agricultural implement and other industries rather than wait for events.

GREATER FAMILIARITY WITH MERITS URGED

In speaking of his paper on "What Is the Normal Fracture of Good Malleable Iron?" Enrique Touceda said that it had been written especially for the engineer, the inspector and the manufacturer to give them, as is given to salesman marketing a product, some of the answers to adverse criticism and he urged a better knowledge of these properties so that the defense of malleable castings might be convincingly spontaneous. The paper analyzes in detail the significance of different fractures, illustrating with photo-micrographs. Special prominence was given to an explanation of the silvery fracture where a section is broken in tension, the appearance being a result of light effect upon the grain of the metal which is pulled out in sharply pointed needles. Attention was also directed to the erroneous impression that the strength of malleable castings is in the skin. All of his tests, Mr. Touceda stated, had shown that the first break came in the core and the maximum elongation in the skin. He also announced that recent tests had pointed to a unique property of malleable iron in that as the ultimate strength increased, elongation increased. The paper will be found at greater length in another issue.

LARGE VERSUS SMALL FURNACES

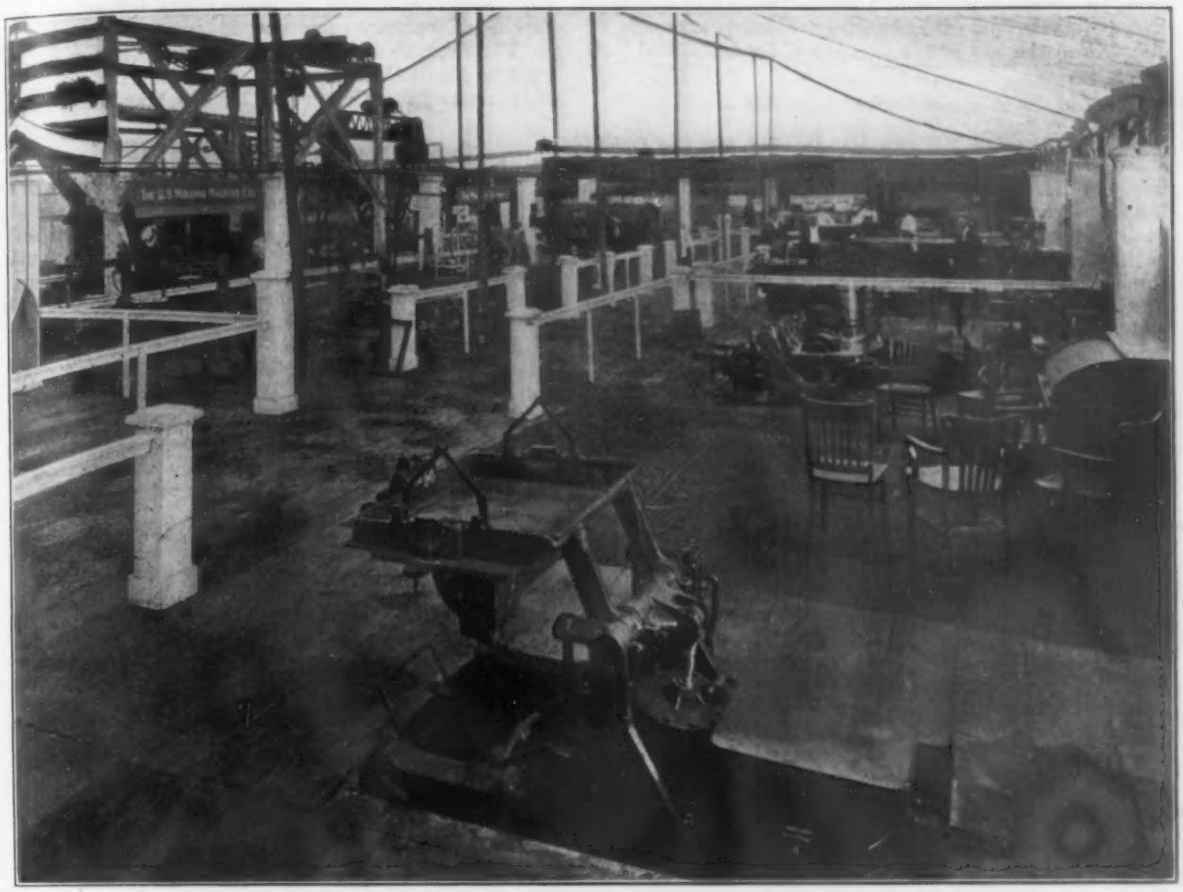
An interesting discussion developed out of the reading of the paper descriptive of a 25-ton air furnace, as published in THE IRON AGE of Sept. 14. Mr. Pero suggested that in the more frequent use of furnaces smaller than 25 tons economy of space was sacrificed for the greater advantages of placing smaller units to give shorter carrying distances for iron resulting in less fatigue for the men, lower labor cost and hotter iron. He stated that there was so little general use for overhead cranes in the average malleable foundry that the installation of necessary carrying equipment, especially for charging, was neglected where it would be a distinct advantage. In his own foundry the prevention of cooling of the metal before pouring was accomplished by having the light work to which the men carried the iron, near the furnace while a rapid overhead carrier took the metal to the heavy work floor at greater distance. In this connection Mr. Davis of Moline, Ill., emphasized the importance of the method of metal distribution, stating that the efficiency of a shop chiefly depends upon the way iron is got to the floors.

Stanley G. Flagg, Jr., Philadelphia, said that his firm regularly operated a 25, 26 and 27-ton furnace and the objections in the matter of carrying distances had been overcome by proper arrangement of the work. Their heavy work is poured from full ladles carried on an overhead carrier. They also used a crane over the furnace for charging. In a large furnace it is advisable to have tap holes at different levels so that the top metal may be taken off earlier, thus preventing a burning of the metal. A 25-ton furnace should melt at the rate of three tons per hour.

New Interest in Steel Foundry Problems

The steel sessions on Thursday and Friday were conceded to be the best in the association's experience. The attendance on Thursday in particular was large, enthusiastic and representative, due chiefly to the fact that electric steel was the feature. The papers were full of the latest developments in this important department of the industry, and in the discussions representatives of all steel-making processes took part. Friday's session

Operating Molding Machines, Hand Traveling Crane, and Cleaning Equipment



View of Molding Machines in Another Section of the Annex

which was not so largely attended, was marked by the discussion of a metallurgical problem of much interest to steel foundrymen—the use of titanium in steel for castings.

THE ELECTRIC FURNACE PAPERS

Thursday's symposium on "Electric Furnace Practice" embraced four papers dealing with three electric furnaces now in use in the United States. While steel for the foundry was uppermost, the adaptability of the electric furnace to other grades of steel was not lost sight of, particularly in the case of the Grönwall-Dixon furnace, which thus far has operated in this country only on high-grade alloy and carbon steel for billets.

The Snyder electric furnace was represented by a paper, "The Ideal Electric Furnace for the Steel Foundry," written by F. J. Ryan, E. B. McKee and W. D. Walker, and presented in abstract by C. M. Booth of the Snyder Electric Furnace Company, Chicago. He was introduced by W. A. Janssen, vice-president of the association, who presided.

Some recent developments in the use of the Heroult electric furnace were given in two papers—"The Electric Furnace in the Foundry," by E. B. Clarke, president Buchanan Electric Steel Company, Buchanan, Mich., and "Electric Furnace Practice in the Manufacture of Steel Castings," by T. S. Quinn, secretary-treasurer Lebanon Steel Foundry, Lebanon, Pa. Each was presented in abstract by the author. John A. Dixon, of the John A. Crowley Company, Detroit, Mich., gave a brief abstract of Mr. Crowley's paper on "The Grönwall-Dixon Electric Melting and Refining Furnace." This furnace was described in an article in THE IRON AGE, Sept. 7, 1916, and abstracts of the three other papers were published in THE IRON AGE, Sept. 14, 1916.

THE DISCUSSIONS

J. J. Bever, of the Otis Steel Company, Cleveland, asked Mr. Booth what the loss was in melting with the Snyder furnace. The reply was that in acid practice it had been found to be only 1 per cent, while for basic melting no data were available.

R. F. Flintermann, president Michigan Steel Casting Company, Detroit, in discussing Mr. Clarke's paper, said that this company's experience in operating for some time two Heroult furnaces showed that extreme care was necessary at all times, and that one of the greatest difficulties was keeping the metal free from slag contaminations. He had found the chemical and physical properties of electric steel the best, and believed that a year or two would see great developments from the use of electric furnaces.

The Training of Operatives

John A. Dixon, in response to questions, said a misconception was prevalent regarding skilled help in operating an electric furnace. He had found no difficulty in fitting men in two to three months to operate successfully an electric furnace—men who were by no means trained, but of ordinary ability and experience. The use of such men he considered impossible in open-hearth practice.

While the Grönwall-Dixon furnaces had not become prominent in connection with steel castings in this country, Mr. Dixon cited the experimental work of a 500-lb. furnace of this type which, operating basic, in Detroit, had made 118 heats on one roof.

Current Consumption

Replying to M. G. Tielke, secretary-treasurer of the Crucible Steel Casting Company, Cleveland, who asked why the current consumption was put at 550 kw.-hr. per ton for liquid alloy steel and at 500 kw.-hr. for steel castings, Mr. Dixon attributed the difference to the time consumed in taking analyses of alloy heats.

T. S. Quinn observed in his paper that a consumption of less than 950-kw-hr. per ton of steel on his 1-ton Heroult furnace would probably have been possible had the transformer capacity been larger. M. G. Tielke offered the experience of the Crucible Steel Casting Company in the use of its 1-ton Heroult furnace where the transformer capacity was so large that on 118 heats the average consumption had been only 645 kw.-hr.

E. L. Crosby, Detroit Edison Company, Detroit, who was called upon, drew attention to the development in Detroit in the use of electric power where now a 6-ton and a 3-ton Heroult furnace were operating as well as a

5-ton Grönwall-Dixon, with a 10-ton furnace of this type under construction. He expected decided progress in all districts in the use of electric power for industrial purposes.

The Rennerfelt Furnace

While the Rennerfelt electric furnace was not represented on the program, the chair called on C. H. Vom Baur, of Hamilton & Hansell, New York, who spoke of the furnace as a polyphase unit operating either acid or basic. In general he regarded the electric furnace as by no means a cure-all for the steel-maker's troubles, but emphasized the importance of the personal element. The question of refractories is now a serious one to many, since the average material for a basic furnace is by no means as good as it was two years ago. Mr. Vom Baur spoke of a 1½-ton Rennerfelt furnace operating abroad and producing ingots of alloy and other steels where the power consumption at the start was 816 kw.-hr. per metric ton, but at the end of the fifth week it had fallen to 611 kw.-hr. per ton. The average for seven weeks was 602 kw.-hr. per net ton of metal. The percentage of crop was 11.48 per cent, with 3.39 per cent lost in burning off and from scrap on the floor.

Edwin F. Cone, New York, called attention to the relative consumption of ferromanganese in the various steel-making processes. He said the electric process had a distinct advantage in that an addition of 7 to 8 lb. of 80 per cent ferromanganese per net ton of steel introduced an average manganese content of about 0.60 per cent into the steel, while in the open-hearth process about 17 lb. per ton and in the small converter very much more was needed to achieve the same result. He regarded these facts as showing the more healthy or non-oxidized condition of electric steel.

Mr. Cone also made a comparison of the quality of steel from the electric and other processes based on many static tests he had made. Referring to the high elastic ratio of 61 per cent in the electric steel tests in Mr. Quinn's paper, the speaker said that static results of steel castings depend largely on the heat treatment and the method of taking the elastic limit. In Mr. Quinn's tests the heat treatment had been slow cooling from the proper temperature and the elastic limit was taken by the drop of the beam, checked by the dividers. With these two conditions of testing as a basis, Mr. Cone's experience with electric steel confirmed Mr. Quinn's results of an elastic ratio of 61 to 62 per cent, whereas in the case of open-hearth steel castings or converter and crucible metal the average elastic ratio from a large number of tests was never over 51 to 52 per cent. Acid open-hearth castings in which 0.16 to 0.18 per cent of vanadium had been incorporated showed an elastic ratio of 61 per cent tested under the conditions referred to, whereas converter or open-hearth castings, if cooled quickly in the air, gave an elastic ratio of 60 to 62 per cent. Without having figures for electric steel so heat-treated the speaker thought it reasonable to assume that it would run over 70 per cent.

Comparison of Electric and Bessemer Steel

"Electric and Converter Steel Compared" was presented by Peter Blackwood, Blackwood Steel Foundry Company, Springfield, Ohio, and was decidedly in favor of converter steel as opposed to electric, the author granting practically no merits to the latter.

E. B. Clarke, Buchanan, Mich., taking up Mr. Blackwood's reference to the inferior quality of electric castings when machined, stated that he had always detected a difference between electric and any other steel when being machined in that the former appeared tougher and more uniform.

ALUMINA IN STEEL

A paper of noteworthy research merit was contributed by G. F. Comstock, metallurgist of the Titanium Alloy Mfg. Company, Niagara Falls, N. Y., on "The Presence of Alumina in Steel." The author had a large number of photomicrographs thrown on the screen. A liberal synopsis was given in THE IRON AGE, Sept. 14, 1916. Coming at the close of a rather long session little discussion was offered, but in reply to a question as to the results of tests when alumina was present, Mr. Comstock said that he had not made many, but he believed a few small inclusions had no bad effect.

The scheduled paper on "The Manufacture of Manganese Steel Castings," by W. S. McKee, American Manganese Steel Company, Chicago, was not presented.

TITANIUM IN STEEL-MAKING

The use of ferrotitanium in steel castings was the feature of the steel session Friday morning. W. A. Janssen read his paper "The Use of Titanium in the Manufacture of Steel Castings." Particular attention is called to the benefits obtained by the use of ferro-carbon-titanium in basic practice as carried out at the plant of the Bettendorf Company, Davenport, Iowa.

A written discussion from N. Petinot, electro-metallurgical engineer, New York, was read. After stating that the addition of titanium to steel properly made results in advantages, particularly in those grades of steel which are reduced to sections, Mr. Petinot took exception to Mr. Janssen's statement that titanium does not form alloys:

> It is possible to make steel containing titanium, and without excessive loss of titanium, if the carbon-free alloy is used, but if the ferrotitanium used has a carbon content, the titanium existing in it as a double carbide of iron and titanium, it is impossible to get any appreciable titanium content in the steel, even when figuring on a large loss.
>
> The same has been found true in making vanadium steels and it is for this reason that carbon-free ferrovanadium is always used instead of the grade with a carbon content, such as was imported a few years ago from abroad, in which the vanadium is present as a carbide of vanadium or rather as a double carbide of iron and vanadium.

IS VANADIUM A DEOXIDIZER?

Mr. Petinot took exception to the author's statement that the amount of titanium necessary depends on the kind of steel to be treated, *i.e.*, that 13.2 lb. per ton of a 15 per cent alloy should be added to rail steel, while for steel castings only 1.5 to 2 lb. per ton is sufficient, by saying:

> I think this statement requires some explanation. A heat of steel made for rails, requiring 0.65 to 0.95 per cent of carbon should finish less oxidized than a steel casting heat of 0.17 to 0.40 per cent carbon and consequently should not require more, at least not six times more, deoxidizer than the latter.
>
> Vanadium is not a deoxidizer and the usual loss of 10 to 25 per cent of the vanadium addition does not indicate a deoxidation of the steel. The same phenomenon is observable when ferrochromium is added to steel. Is chromium therefore a deoxidizer? It is more generally accepted by metallurgists that the loss of vanadium is due to the fact that small pieces of the alloy become coated with slag and are thus wasted by floating to the top of the metal. If considered as a deoxidizer it would certainly be a very expensive one.

AS A SUBSTITUTE FOR MANGANESE

> I agree with Mr. Janssen that vanadium steel, like all other alloy steels when properly made, can be improved by ferrotitanium as the final addition, but I do not agree with him when he says that he can by the use of the titanium reduce his manganese content from 0.75 to 0.50 per cent and get the same physical results.
>
> In making heats of steel in acid or basic open-hearth furnaces, we all know the fluctuation in sulphur from heat to heat when the final test piece is analyzed. We also know from experience that when heats are high in sulphur and low in manganese, cracks appear more freely in the castings, manifesting the phenomenon of red shortness.
>
> Steel-makers also know how hard it is to obtain the right percentage of manganese content in the steel, and many of us have found from experience that occasionally while aiming for a manganese content on the high side of the specification, the final analysis of the heat shows it to be on the low side, or that the heat has a low manganese content. If Mr. Janssen by the use of ferrotitanium can reduce his manganese from 0.75 to 0.50, I would ask him what the low limit is that he gets when aiming for 0.50 per cent and if he has found a way to get exactly the amount of manganese he wishes.
>
> I would also ask him what limits of sulphur he usually gets in his grades of steel with a manganese content of 0.50, particularly in acid steel. I have had some experience making ingots of acid steel for forgings in which I tried to re-

(*Continued on Page* 673)

President Farrell at Duquesne's Celebration

The borough of Duquesne, Pa., in which the Duquesne blast furnaces and steel works of the Carnegie Steel Company are located, held a silver jubilee celebration last week, having been founded in 1891. On Wednesday evening, Sept. 13, the Duquesne Board of Commerce gave a banquet, at which James A. Farrell, president of the United States Steel Corporation, and officers of the Carnegie Steel Company were present. E. J. Hamilton, general superintendent of the Duquesne steel works and blast furnaces, was toastmaster. Over 400 persons were present.

The principal address was made by Mr. Farrell, who referred to the Duquesne plant as one of the largest of the Steel Corporation, turning out more than 1,100,000 tons of pig iron and nearly 1,400,000 tons of steel ingots each year. The plant employs 5000 workmen and the payroll is about $5,500,000. Mr. Farrell said that 1916 will probably go down in history as one of the most remarkable years the American iron and steel industry has known. He added that without resorting to prophecy it may be assumed that 1917 will see blast furnaces and steel works in the United States operating at capacity. He referred to the rapid growth of Duquesne and the fine community spirit existing there. He paid a high tribute to the work of Homer D. Williams, who had been called from Duquesne to the presidency of the Carnegie Steel Company, and to that of E. J. Hamilton, Mr. Williams' successor.

Addresses were also made by Homer D. Williams, by Robert Garland, president of the City Council of Pittsburgh, and others. The original Duquesne steel plant was built in 1886-1888 by the Pittsburgh Bessemer Steel Company to roll steel rails. The company encountered difficulties in getting raw material, and the plant passed to the control of Carnegie, Phipps & Co. All the original equipment was long ago dismantled. Later the Bessemer steel plant was torn out, and for some years the Duquesne plant has been strictly an open-hearth proposition. The plant now has six blast furnaces making over 3,000 tons of pig iron per day, and there are two open-hearth plants containing 32 furnaces. The steel is finished into slabs, billets, sheet bars, splice bar shapes and merchant steel bars. The last-named is the leading product of the Duquesne works, the present capacity being about 650,000 tons of steel bars per year. This will be further increased when a new bar mill and other improvements are completed. Welfare work has been carried on very extensively at the Duquesne works for many years.

To Assist in Developing Russian Resources

Frederick Holbrook, senior partner in the engineering and contracting firm of Holbrook, Cabot & Rollins, and a vice-president of the American International Corporation, sailed yesterday for Petrograd, Russia, in the interests of the latter company. He will make his headquarters in Petrograd. Several American engineers and others are also going to Russia for the American International Corporation, and under the direction of Mr. Holbrook will investigate the possibilities of developing the natural resources of Russia, and assist Russian interests in building railroads, opening mines and establishing steel works and other industries. Mr. Holbrook's trip is the third he has made to Europe since the outbreak of the war. He spent several months in Russia this year, and previously went to France accompanied by representatives of the Lackawanna Steel Company.

M. Speer has severed his connection as general manager with the Sharon Iron & Metal Company, Sharon, Pa., after five years of service, and has engaged in business in Youngstown, Ohio, under the name of the Speer Iron & Metal Company, with offices in the Stambaugh Building. He expects to equip a yard shortly.

The H. Koppers Company, Pittsburgh, Pa., has awarded a contract for the castings and steel for the construction of a coke-oven plant at Pueblo, Colo., to the United Iron Works, Springfield, Mo.

MASTER PATTERNMAKERS

A New Association Formed at the Foundrymen's Convention

Prior to last week's meeting of foundrymen at Cleveland inquiry was made as to the feasibility of starting a technical association of master patternmakers. Over 200 names were obtained of those actively interested. On Sept. 14 about 30 master patternmakers present at the Cleveland convention were invited by E. C. Anderson of the Thomas E. Coale Lumber Company, Philadelphia, to attend a preliminary meeting and dinner at the Hotel Statler. Among those in attendance were A. Crowe, superintendent pattern department Youngstown Sheet & Tube Company, Youngstown, Ohio; Ira Cole, superintendent American Road Machinery Company, Delphos, Ohio; F. E. Delano, superintendent pattern shop, General Electric Company, Erie, Pa.; W. J. Hamman, foreman American Road Machinery Company, Delphos, Ohio; W. J. Heger, superintendent pattern shop, Willys-Overland Company, Toledo, Ohio; George R. Hogg, superintendent pattern department United Engineering & Foundry Company, Youngstown, Ohio; John Howarth, superintendent pattern department Westinghouse Electric & Mfg. Company, Cleveland; C. D. Morris, manager Oak Street plant, United Engineering & Foundry Company, Youngstown, Ohio; John Pemberton, superintendent pattern shop, General Electric Company, Lynn, Mass.; J. H. Taylor, superintendent pattern shop, Fore River Shipbuilding Company, Quincy, Mass.; S. A. S. Wormsted, superintendent pattern shop, Goulds Mfg. Company, Seneca Falls, N. Y.; E. C. Anderson and A. Warren Anderson, Philadelphia. Robert I. Clegg, Cleveland, acted as temporary chairman and C. G. Kisner as secretary.

After a general discussion of the possibilities of the proposed organization, it was decided to appoint an advisory committee to consider the various matters incidental to starting the movement. The committee was made up of John Pemberton, Lynn, Mass.; A. Crowe, Youngstown, Ohio; J. H. Taylor, Wollaston, Mass.; F. E. Delano, Erie, Pa., and J. Shay, Bridgeport, Conn. A tentative constitution was offered and will be critically considered by the advisory committee and also mailed to the entire list of names.

It is expected to hold an annual meeting at the same time and place as the American Foundrymen's Association. The objects of the new organization as outlined by the proposed constitution are "the improvement of the art and practice of patternmaking, to promote social intercourse among the members of the association, to provide for the exchange of technical experience, to encourage uniform standards in shop methods, and in general to advance whatever shall tend to the dignity and reputation of pattermaking and the well being of members of the association."

Office headquarters have been opened at 206 Bellevue Court Building, Philadelphia.

Alumina in Steel

The photomicographs used to illustrate the article in THE IRON AGE of Sept. 14, 1916, on "The Presence of Alumina in Steel," by G. F. Comstock, were all reduced about one-third from an original magnification of 200, except Fig. 6, which originally was 29 diameters. This important fact was not stated in connection with the article as was intended.

Henry S. Berry has been elected president of the Owensboro Forging Company, Owensboro, Ky.; S. R. Ewing, vice-president, and S. R. Ewing, Jr., secretary, treasurer and general manager. The company has just completed extensive additions to its plant, which is now equipped with gas-burning japanning ovens.

The Mansfield Sheet & Tin Plate Company, Mansfield, Ohio, will install six hot mills, four roughing mills and eight stands of cold rolls in the extension to its plant which it recently decided to build.

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Steel Trade After the War

Opinion as to what will occur in the steel trade after the war has passed through a period of evolution. During the first ten or twelve months of the war it was not even recognized that the American steel industry was to be really prosperous at any time during the war, so that any vague notions then entertained as to what might happen after the war are not worth recalling, when the view as to the course of trade during the war was so mistaken.

The earliest view that need be considered was that upon its becoming known that the war was to end there would be a complete collapse, to be followed possibly, but not certainly, by a recovery to fairly prosperous conditions. The rapid rise in prices in the early months of this year, from a level on January 1 substantially equal to the top level reached in 1907, suggested that a collapse might occur before the end of the war. With the view most commonly entertained now in the ranks of steel producers, if not of steel consumers, that a very strong steel market is to obtain throughout the duration of the war there is an increase of belief that in the main prosperous conditions will rule in the steel industry for some time after the war.

That the steel trade expects the war to last for another year at least is indicated by its adoption, even up to the present time, of plans for increases in capacity that are directly predicated upon a continuance of war demand, and that it expects a good demand, on an average, in the years to follow appears from the large plans that are being prosecuted in such leisurely fashion as to indicate no hope of the capacity involved being brought in before the war ends.

In considering the prospective demand after the war, irrespective of prices, it may be helpful to consider what would occur should the war cease now. Orders for shipbuilding material would hardly be canceled; and if they were, the disturbance would not be in proportion to the total tonnage on books, because the deliveries are extended over so great a period of time. Certainly undertakings involving the use of fabricated steel would not be dropped, the expectation being rather that the end of the war will see an increase in investment structures. Automobiles would be salable as formerly and automobile material would be required as at present. Automobile exports represent only a very small percentage of the production. The demand for agricultural implements and everything required by the farmer, at reasonable prices, would be stimulated rather than otherwise. The railroads could hardly be moved to a more conservative course, as to buying, than they are pursuing now. Once the shock were passed, the actual ultimate demand might assert itself in full volume.

The opinion is strongly held in many quarters that the steel industry, and industry in general for that matter, must eventually liquidate in the matter of costs. The best judgment seems to be that such liquidation can only be effected, in practice, through the medium of a period of greatly restricted activity. It is not assured, however, that a drastic readjustment will be necessary. There are those who believe that in the present belligerent countries the returning soldiers will demand, and receive, much higher wages than formerly. In our own country there must be felt the influence of continued light immigration during the war, and there certainly is no good reason for concluding that there will be a real flood of immigration after the war.

A feature of demand for steel is that it grows while it sleeps. As steel enters so largely into construction work, the actual needs accumulate in periods of uncertainty and are expressed in larger volume than ever when the uncertainty is removed. The demand in neutral countries must be banking up. Though their progress is retarded they must be making some progress. The supplies of steel they have obtained in the past two years have been but a small fraction of normal. The end of the war would bring ocean freights down instantly, and that would effect a very attractive reduction in prices of steel delivered to the non-producing countries. The export trade would probably give a very fair account of itself.

As to the demand for steel in the United States, a long range view may be illuminating. As indicated in our presentation a week ago, the steel ingot producing capacity on July 1, 1917, will be about 45,000,000 tons a year. The capacity five years earlier was probably in the neighborhood of 33,000,000 tons, showing a total increase of 36 per cent. This is an average annual increase of 6.4 per cent,

which would be less than a rate of doubling in ten years, as it represents an increase of 86 per cent in such a period. As during a considerable part of these five years production has been at a low rate, and as a great deal of the material produced has been exported, there has easily been room for a considerable volume of domestic demand to accumulate, to be expressed in actual orders at some future time, while apart from this consideration it is a fact that the productive capacity is not increasing, on the whole, at a rate with which the steel industry has been familiar in the past.

Exporters Cannot Co-operate

Brief announcement was made last week of the failure in the United States Senate of the effort to pass the Webb bill authorizing the formation of combinations in the export trade. This ignominious ending of a praiseworthy movement received far much less attention in the daily press than it deserved. The bill had been fathered by the Federal Industrial Commission and was so free from what might be considered objectionable features that it should have encountered no difficulty in its passage through the Senate and its enactment into law. Unfortunately, however, the Senate embraces among its members some who feel that they must antagonize anything favored by manufacturing interests and see a menace to the public welfare in any proposition that even hints at co-operation. If the Webb bill had gone through, with this well-known feeling among certain political leaders, that would have been accepted as an indication that the animosity against manufacturers was at last softening and that a better era had dawned. But it seems that this was too much to expect. In view of what other countries are doing to promote the interests of those who seek foreign trade, it is to be hoped that our government may in time come under the control of men of broader vision.

Labor Saving and Labor Shortage

It is being borne in upon the managers of manufacturing plants that the acute labor shortage with which they are now contending is not to be of the temporary variety of past experience. Heretofore industry has looked to an approaching winter season, or, farther ahead, for immigration to bring about an adjustment of the supply of labor. But whether relief from labor shortage has been timely or not, lack of sufficient help has always been looked upon as one of the necessary evils of industrial prosperity and a condition for which the cure would come as the volume of business declined. There is no such prospect to-day. Some estimates have put the demand for skilled and unskilled workers for the manufacturing operations of the country alone at 5,000,000 in excess of the supply. The duration of this shortage is wholly indeterminate. It is not certain that even a pronounced slump in business will effect an adjustment.

The problem of working out a better adjustment of the supply and demand for labor squarely confronts the plant executive. It is a golden opportunity for the manufacturer of labor-saving equipment. Never has there arisen a situation giving such a powerful impulse to the devising of mechanical contrivances to replace hand labor. Plant operators are turning to the possibilities in this direction with an eagerness that makes equipment selling well-nigh a benefaction. In the foundry industry where, in the opinion of many practical men, there has been an over-equipment of plants, managers are ready to install any improvement that will eliminate manual operations. Operators of malleable foundries, for example, who, because the lightness of the average product of their shops required no general overhead conveying equipment, have been slow to use charging and carrier devices, are now conspicuous in seeking such apparatus. The exhibit of foundry and machine shop equipment in connection with the meeting of the American Foundrymen's Association at Cleveland last week unmistakably revealed this situation. The designer and builder of machinery for the foundry, the machine shop or the general manufacturing plant has now ready to hand his greatest opportunity for service and profit.

Japanese Ship Subsidies to Be Reduced

An interesting item of news from Japan is that the government is considering the reduction of national assistance to shipbuilders. The remarkable growth of Japanese shipping has not been a mere accident, but is due to a considerable extent to the stimulus afforded by the government through the payment of subsidies to shipbuilders. While this country has done nothing for the preservation of its commerce on the Pacific Ocean, but has even dealt it deadly blows, Japan has for some years been appropriating large sums for the cultivation of its shipping industry. This was done so opportunely that when the European war broke out and many ships were diverted from commercial to naval purposes by the belligerents, Japanese shipowners profited prodigiously. The highly remunerative freight rates earned by ships have since then been an even greater stimulant to the growth of Japanese shipping than the government subsidies. This growth, however, has resulted in a very heavy increase in the amount which the government is called upon to pay to its shipbuilders. The payments in 1914 amounted to $815,000 and will this year be $1,561,000, while next year they are expected to run up to about $2,900,000 and to reach an even higher sum for 1918. Such an unforeseen development has caused the Japanese authorities to consider the advisability of reducing the amount for encouraging shipping, but it is to be done very carefully so that the progress of the shipping industry may not be checked.

Mortality statistics just published show that in 1915 the death rate in the United States was the lowest ever known, having been only 13.5 per 1000 of population. This compares with a rate of 16 per 1000 ten years before and of practically 19 a decade earlier. These figures are a significant indication of the very great advance which has been made in both medical science and proper methods of living. Undoubtedly some credit must also be given to the attention now being paid to accident prevention.

The Properties of Conductivity Steel

Its Use for Conductor Rails—Experience as to the Effect of Various Impurities—Actual and Theoretical Resistance

IN a recent issue of the *Journal* of the West of Scotland Iron and Steel Institute are two interesting papers on "Conductivity Steel." They are by C. H. Ridsdale and S. W. Melsom respectively, and while concerned chiefly with the methods of testing these steels for conductivity, they contain a good deal of information regarding their manufacture. Mr. Ridsdale is connected with the North Eastern Steel Company of Middlesborough, which was probably the pioneer company in England making steel for conductivity purposes, using the basic Bessemer process for this purpose as far back as 1883 or 1884. At that time most of the steel went into billets for telegraph wire, but since 1898 most of it has been for conductor rails.

With the growth of subways, elevated roads, and the electrification of railroads the demand for steel for conductor rails is rapidly increasing and the manufacture of such rails in the United States is becoming more marked. For this reason the papers mentioned, giving retails of the practice in England, are of considerable interest. An abstract of Mr. Ridsdale's paper is as follows:

Steel for conductivity purposes is, or should be, the softest class of steel made. Owing to the small quantity of metalloids it has a higher density than other ordinary forms of steel, and also very little segregation. Speaking broadly, the more nearly it approaches in chemical composition to pure iron, and the lower it is in carbon, silicon, sulphur, phosphorus, manganese or other constituents, the better it is in conductivity. While this is correct as a general rule, it must not be taken absolutely, especially as between steels made by different processes. As an example, a specific instance may be given of two steels of fairly typical composition:

	Basic Bessemer, Per Cent	Basic Open-Hearth, Per Cent
Carbon	0.03	0.09
Manganese	0.36	0.17
Sulphur	0.05	0.04
Phosphorus	0.06	0.04
Silicon	None	None
Resistance in "times copper of equal volume"	6.7	7.00

Conductivity steel is simply the "blown" or "bath" metal (purified by oxidation) with the smallest quantity of deoxidizer or "recarburizer" added that will just enable it to roll. Thus it is metal only just removed from redshortness. Indeed, this is the main trouble that steelmakers have to face. In the endeavor to keep the steel very soft and low in resistance they have all the time to work within such a narrow margin that from time to time they overstep the line, and the steel breaks up in the rolls giving scrap or defective rails. Also when not so pronounced as this, in steel near the limit, parts of the section which grow cold sooner than the rest are liable to show a number of fine hair cracks close together when they drop to low red, although it will roll quite sound at a bright red heat.

It may be useful to mention here that slight cracks due to redshortness, as for instance fine saw edges along flanges or corners (which, if present in ordinary track rails would certainly disqualify them) are no disadvantage for the purpose of a conductor rail which has no weight to carry. Indeed they should be regarded with favor as they are an indication that the rails have a very low resistance.

Mr. Ridsdale then describes in detail his methods of testing, which will not be gone into here, and he has some very interesting observations on matters of practical bearing which arise from the peculiar properties of conductivity steel. The extreme softness of the steel renders special care necessary in order to avoid bending the rails, especially when in long lengths.

The following conclusions are given from the author's experience regarding the effect of various bodies on conductivity in actual practice:

Oxygen is not detrimental up to the limits which steel will carry and yet roll with only slight redshortness.

Aluminum is said to reduce vastly the conductivity in wire, but the author has no direct experience on this point.

Carbon has a very pronounced effect in reducing the conductivity.

Phosphorus reduces the conductivity, but apparently not to the same extent that carbon does.

Silicon reduces the conductivity probably even more than carbon does.

Sulphur apparently only reduces the conductivity very slightly, and in some cases almost appears to improve it. This is probably owing to its removing some of the manganese from the combined condition. It cannot, however, be present to any large extent, or the steel which is usually low in manganese would not roll at all.

Manganese reduces the conductivity materially, very much as carbon does, but its effect appears to vary more.

Copper is stated to increase the conductivity greatly, but this has not been borne out by experience, at any rate as regards such small quantities as it might be commercially practicable to add.

To sum up, from personal observations over many years, it may be said that the relative effects in increasing resistance are, per 0.01 per cent of the substance present in excess of that in ordinary conductivity steel:

Carbon,	from 0.05 to 0.07 times copper
Manganese,	from 0.05 to 0.07 times copper
Sulphur,	from 0.08 to 0.10 times copper
Phosphorus,	from 0.02 to 0.03 times copper
Silicon,	from 0.08 to 0.10 times copper

The higher value to be taken when within the ordinary limits for conductivity steel, say not over 0.10 per cent carbon or 0.40 per cent manganese, and the lower value when above this.

Too much importance must not be attached,

Material	Carbon, Per Cent	Manganese, Per Cent	Sulphur, Per Cent	Phosphorus, Per Cent	Silicon, Per Cent	Resistance. Times Copper at 20 Deg. C. of Equal Area: Actual	Resistance. Times Copper at 20 Deg. C. of Equal Area: Theoretical Taken as basis
Conductivity steel (average)	0.04	0.40	0.06	0.06	None	6.87	7.73
Ordinary soft steel (average)	0.086	0.49	0.06	0.062	None	7.72	8.43
Medium hard steel (individual)	0.24	0.45	0.06	0.05	0.02	8.58	11.70
Hard steel (individual)	0.375	0.95	0.078	0.075	0.028	11.75	11.67
Hard steel (average)	0.412	0.92	0.08	0.072	0.028	11.57	11.71
Hard steel (individual)	0.45	0.87	0.06	0 06	0.028	11.40	13.07
Hard steel, high silicon	0.46	0.72	0.06	0.07	0.336	13.07	9.31
Hard steel, low manganese	0.48	0.36	0.04	0.04	0.06	9.54	

however, to these figures, as they are not based upon sufficiently systematic investigation. Further, as these values are not always the same in different qualities of the same make of steel, or in corresponding qualities of different makes, it is questionable whether any investigation, no matter how painstaking, will reveal a definite and reliable co-ordination.

As illustrating the effect of composition the accompanying table gives some average and individual actual tests, showing side by side the actual and theoretical resistance. The latter is calculated on the basis and from the factors given.

The method of manufacture of these steels is not given. One other point of interest in connection with conductor rails is the average effect which is obtained when rails of different resistance are coupled up. Thus a rail of eight times the resistance of copper and another of six yield the same resistance as two of seven, and specifications therefore allow a proportion of rails with a maximum above the average specified. G. B. W.

Eliminating Difficulties in the Steel Foundry

Co-operation Between the Designing Engineer and the Foundryman Will Remove Many Causes of Rejected Castings

In a symposium entitled "Results of Co-operation Between the Engineer and the Foundry," presented at the Cleveland meeting of the American Foundrymens Association, Sept. 11-15, John Howe Hall, of the Taylor-Wharton Iron & Steel Company, High Bridge, N. J., discussed some of the difficulties which arise in the steel foundry, due to imperfect understanding by the foundry of the desires of the designing engineer, or to the latter's lack of knowledge of the limitations of steel foundry practice.

Steel foundry difficulties may usually be classed under (1) Physical and chemical specifications; (2) attempting to make castings of a design unsuited to steel foundry work. Specifications that cannot be well executed may be divided into several general classes: A—That which includes chemical or physical tests that are out of the ordinary. B—Specifications calling for a manganese content to be under a figure which is now known to be quite low for good steel. C—Specifications of alloy steel, when a good grade of ordinary carbon steel will give better results or specification of alloy steel without specifying the amount of alloy that is desired. D—Specification of a high elastic limit or specification of an elastic limit which cannot be obtained without heat treatment, which is impossible on account of the design of the casting. E—Specification of one kind of alloy steel when the experience of the foundry is that an entirely different alloy steel will give better results. F—Specification of both physical and chemical properties of the steel which are antagonistic.

EXAMPLES OF SPECIFICATION TROUBLES

An instance of the first class of specification is the limiting of sulphur or phosphorus to a figure which can only be obtained with an electric furnace or crucible steel. Frequently the price to be paid for the casting will not warrant steel of this character. Difficulties such as are cited above can usually be overcome by a conference between the steel foundryman and the designing engineer. A high elastic limit is often called for by the engineer with the expectation that the steel can be machined under heat treatment. If an elastic limit is specified which cannot be obtained without special heat treatment, the design of the casting often is such that heat treatment cannot be given without cracking it. Such cases, of course, can be handled either by modifying the elastic limit desired, or by modifying the design of the casting to remove all danger of its cracking in the heat treatment. In case of the specification of one kind of steel where, in the judgment of the foundry, a different steel would serve the purpose, a conference with the engineer may be the source of much information for both parties. The engineer may specify a steel which in his belief will be the best for the particular purpose, but without any adequate experience upon which to base this belief. Or, he may be specifying it in a purely experimental way in which event the foundrymen may obtain valuable data by co-operating with him. On the other hand, the foundry may be able to advise the engineer that the experiment is not worth while as the foundry has already made the same experiment.

Many of the above troubles can be eliminated by the use of standard specifications prepared by societies of recognized standing and adhered to by both makers and buyers of castings. Even some of these standard specifications will cause trouble by over-specifying. For instance: One specification gives the physical properties desired in steel and also the heat treatment by which these properties can be obtained. This heat treatment secured the physical properties desired in certain classes of steel, but in another class of steel a special heat treatment was necessary to secure the same property. A strict adherence to the letter in the specifications ruled out entirely the practice of a foundry which used steel of the second class. Equally important to the foundryman is the necessity of securing uniformity of specifications of steel castings on the part of various representative societies. Overlapping of specifications in one instance so reduced the range of physical properties allowed that it was difficult, if not impossible, to obtain castings which would pass inspections under the three sets of specifications under which the work was being carried on.

THE QUESTION OF DESIGN

Troubles due to design are so numerous that it is impossible to mention all of them. Aside from the rather obvious error of specifying a casting so thin that it cannot be run in cast steel at all, the more common errors are so designing a casting that it cannot be made without showing bad cracks, or designing it so that it cannot be made truly sound. High shrinkage of cast iron, sometimes aggravated by the sulphur in the steel and the necessity of pouring the casting very hot are chiefly responsible for cracked castings. Trouble may arise by a customer insisting upon a steel casting being made from patterns used for gray iron castings without any change in the design. Foundrymen from experience usually can predict from examination of the pattern whether or not the casting will be lost, and suggestions on his part to the designing engineer will save much trouble and expense.

It frequently happens that castings are so designed that it is impossible to make them truly sound. This is usually due to the fact that sections are so distributed that there is no place to attach a sink head of sufficient size or proper design to fill the fluid shrinkage of heavy sections. In such cases, a conference with the designing engineer will lead to a change in the pattern which will enable the casting to be made truly sound.

Copper imports at Havre, France, in 1915 are reported as 105,496 metric tons against 63,905 tons in 1914, nearly all coming from the United States as ingots, bars or sheets. Of the 1915 total, 103,962 tons is designated as for consumption in France, with total exports credited with 457 tons.

STRIKES AND SETTLEMENTS

New England Troubles Diminishing

In Pittsfield, Mass., a conference has been arranged between the management of the General Electric Company and its striking employees. There seems to be a general feeling that some compromise will be reached and that the trouble will not long continue. In Greenfield, Mass., the strike is still in force, but it is reported that more men are at work than a week ago. In Bridgeport, Conn., the report of the molders' strike is the same; the men are still on strike, but there is a gradual increase in the number at work in the foundries.

Strikes Successful at Nashville

Two more shops at Nashville, Tenn., have met the demands of their machinists for an 8-hr. day, on a scale of 45c. per hour. Their men had been on strike three weeks. All of Nashville's important shops are now on the 8-hr. day basis.

Violence at Milwaukee

Public interest in the machinists' strike for an 8-hr day in the Milwaukee district has been revived, after a lull of two weeks or more, because of strikers' efforts to intimidate men who remained at work or returned to employment. A number of arrests for violence have been made and riot notices have been served on the sheriff of Milwaukee County, a socialist. This is the first time that such action has been brought under the Wisconsin riot statute—service of which lays the county liable for all damages caused by strikers or their sympathizers. No new strikes have been declared for nearly a month. On Sept. 18 the strike completed a period of 60 days, and the unions have made no headway in inducing the employers to recede from their position.

MILWAUKEE, Sept. 19, 1916.—(*By Telegraph.*)—The end of the machinists' strike is in sight before Sept. 30. The majority of strikers at the plants of the Nordberg Mfg. Company, Bucyrus Company and Allis-Chalmers Mfg. Company returned to work Monday and Tuesday without concessions, and more are expected to return during the week. The Metal Trades Association reports nearly 55 per cent of strikers already returned and shops now operating with 71 per cent of normal forces.

Brass Plants Heavy Buyers for 1917

Information from reliable sources is that 30,000 tons of brass has been ordered since Sept. 1 for export. These orders call for brass in the forms of rods and discs for use in the manufacture of fuses and cartridge cases. The sizes specified in these purchases emphasize the growing ability of the Allies to make their own fuses and smaller sizes of shells and shell cases. One producer states that the only limit to the volume of the recent orders was the ability of the mills to accept such contracts for early delivery.

The business in exports for munitions use is estimated to be from 20 to 25 per cent of the present mill output, and most of the mills are endeavoring to protect their established domestic trade. The leading interest in the brass industry has requested many of its larger customers to anticipate their requirements up to next June. During the week it was reported that two Connecticut mills had purchased 35,000,000 lb. of copper and another mill had contracted for about 50,000,000 lb. of copper and spelter. It is understood that these contracts are to cover requirements during the first quarter of 1917.

The Panama Canal will, at an early date, issue specifications and call for bids for the construction of two colliers equipped with self-discharging gear, authorized by Congress, with limit of cost at $1,500,000 each. These colliers are to be essentially a duplication of the colliers Ulysses and Achilles constructed by the Maryland Steel Company, carrying 12,000 tons of cargo coal. Major Earl I. Brown, Washington, D. C., is general purchasing officer.

Koppers Coke Ovens at Sparrows Point

The H. Koppers Company, Pittsburgh, has closed a contract with the Bethlehem Steel Company for the erection at Sparrows Point, Md., of 240 13¼-ton Koppers by-product coke ovens, to be arranged in four batteries of 60 ovens each, and also a benzol plant of such capacity that all the benzols from the entire plant of 360 ovens can be recovered and delivered as pure products. The benzol plant will be one of the largest in the world. The Koppers direct sulphate process will be installed in connection with the new ovens. The by-product plant and building will be extended. The present coke plant consists of 120 Koppers ovens, in two batteries of 60 ovens each. Owing to the amount of work the H. Koppers Company now has in hand the new plant is not expected to be ready for operation before the early part of 1918. Work on the building of Koppers ovens at other places is progressing as fast as the supply of labor and materials will permit. The plant of 204 ovens built for the Youngstown Sheet & Tube Company at East Youngstown, Ohio, has been in successful operation for some time. The plan of reducing the width of ovens, as put in effect at this and other plants, has proved quite successful. The Koppers ovens being erected for the United Furnace Company at Canton, Ohio, will be started late this month, or early in October. The 94 Koppers ovens being built for the LaBelle Iron Works across the Ohio River from Steubenville, Ohio, are nearly finished, and the company will start heating them this month.

Railroad Car Business

With another 1000 cars bought by the New York Central, this of the Pressed Steel Car Company, following 4000 of recent closing, further lots from the same source are expected to come to light in the early future. The Western Pacific has apparently placed 1000 cars with the Pullman Company and the Illinois Central has ordered 500 refrigerator cars of the Haskell & Barker Car Company. The Missouri Pacific has come into the market for 1500 gondolas and 1000 box cars, the Western Maryland for 2000 hoppers, and the 2000 various type cars for the Missouri, Kansas & Texas are again up for consideration. The inquiries from abroad for 12,000 cars for Italy and for 10,000 to 20,000 cars for France appear somewhat vague as to authenticity. Of smaller lots, mention may be made of 50 to 100 stock cars wanted by the Atlantic Coast Line and 50 box cars by the Dupont Powder Company. The Pullman Company is to build 25 baggage and express cars for the Lehigh Valley; the Pressed Steel Car Company, 30 hoppers for the Bethlehem Steel Company, and the Haskell & Barker Car Company, 250 ore cars for the Minneapolis, St. Paul & Sault Ste. Marie.

The Sulphide Corporation, Ltd., a smelting works 10 miles from Newcastle, Australia, is operating at capacity, employing about 450 men, working three shifts of 8 hr. each, according to U. S. Consul Lucien N. Sullivan of Newcastle. There are three smelting furnaces of respectively 150,100 and 50 tons capacity of bullion turned out daily, the ore treated being about three times the amount of bullion produced. The gold and silver contents are high, but no separation is made there, the pig lead being shipped to England and Sydney for refining. The weekly output is at present (August, 1916) bullion containing 585 oz. of gold, 61,434 oz. of silver and 685 tons of lead. The company's mines are located in the Broken Hill district.

The report is current that the Shepard Lathe Company, Cincinnati, Ohio, has been purchased by a company headed by C. H. Norton, president Western Machinery Company, Cincinnati, and that the output of the plant will be increased at an early date.

The Wheeling Mold & Foundry Company, Wheeling, W. Va., has closed its plant on account of labor troubles. The company has been working on large contracts for shells for Russia.

The Export Freight Rate Hearing

WASHINGTON, D. C., Sept. 18, 1916.—The suspension board of the Interstate Commerce Commission gave a hearing to-day to representatives of the Pollak Steel Company, Ashland-Ironton Manufacturers' Association, Curtis & Co. Mfg. Company, Whitaker-Glessner Company, Central Steel Company, Inland Steel Company, and others, on the proposed increase in export freight rates on iron and steel. The tariffs of the carriers which are scheduled to become effective Oct. 1 establish the same rate on iron and steel for export from Central Freight Association and Trunk Line Association territories as on domestic traffic, and it is asserted that the increase amounts to 50 per cent.

The representatives of the steel companies asked the board to suspend the proposed increases pending investigation of the subject. It was asserted that the carriers are seeking to obtain part of the profits which the manufacturers are making under present conditions and that the increases are not justified. Representatives of the carriers maintained that when the rates were established foreign competition was severe and they were made unusually low, but that no such competition now exists and therefore there is no reason for the preferential export rate. The board took the arguments under advisement and will file its recommendation with the commission within a short time.

W. L. C.

An Australian Commission to the United States

The Australian Government has decided to appoint an industrial commission to visit the United States to investigate and report upon methods of manufacture and production and the conditions of employment therein. It will consist of six representatives of Australian manufacturers, one from each State, the selection in each case being made by the government from three nominations offered by the chambers of manufacturers of each capital city and the central labor organization from each state. The industries to be investigated are iron and steel; engineering and allied trades; timber, building material, etc.; leather; textiles; paper and foodstuffs. Each section of the commission will furnish a report on the industry it represents, separate reports being made by the representatives of the manufacturers and the workmen. The return of the commission is expected within six months of its departure with all expenses borne by the government.

James Mitchell, president Alabama Power Company, who has just completed a visit to its properties, says the company will at an early date build five additional electric steel furnaces in the plant contiguous to the Anniston Ordnance Company's works at Anniston, Ala. The investment, he says, will be about $1,000,000. The first unit of the plant has been a thorough success. The Ordnance works, which have been successfully making 6-in. shells for the Allies, have received large additional orders.

The Cornwall Ore Banks Company, Lebanon, Pa., a subsidiary of the Bethlehem Steel Company, has purchased approximately two and a half acres from the Lackawanna Iron & Steel Company. The buyer plans to improve its property to increase its output of iron ore. New machinery will be installed. The cost is estimated at about $30,000. Harrison Souder, Lebanon, Pa., is superintendent.

J. H. Sheadle, vice-president of the Cleveland-Cliffs Iron Company, Cleveland; vice-president of the Lake Carriers' Association, and long prominent in the Lake Superior iron-ore industry, is critically ill at Syracuse, N. Y., where he was stricken while on his way to the White Mountains.

The Wagner Electric Mfg. Company, St. Louis, announces the opening of a sales office and service station at 922 North Pennsylvania Street, Indianapolis, Ind., in charge of Charles M. Welch.

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New Steel Plant at Lorain

CLEVELAND, Sept. 20, 1916.—(*By Telegraph.*)—A new steel plant will be built at Lorain, Ohio, by J. C. Cromwell, Cleveland, and associates, who have acquired a 252-acre river front site adjoining the plant of the National Tube Company. While plans are not fully complete, it is understood that it is the intention to erect shortly initial units that will include four small open-hearth furnaces and a mill the type of which is not announced.

The Alliance Machine Company, Alliance, Ohio, will make extensions to its plant about doubling its capacity and involving an expenditure of about $500,000 for buildings and equipment.

INITIAL STRAINS IN STEEL RAILS

Results of a Recent Investigation—Permanent Set Due to Gagging

In reporting on the derailment of a passenger train on the Western Maryland Railway at York Road, Pa., Jan. 7, 1916, due to a broken rail, James E. Howard, engineer-physicist of the Interstate Commerce Commission, gives details of tests conducted at Sparrows Point, Md., in conjunction with representatives of the Western Maryland Railway and the Maryland Steel Company, in the examination of the rail that failed. The report covers 20 printed pages, and Mr. Howard's summary of it is as follows:

"The result of this investigation shows that the failure of the rail which caused the derailment was due to a split head. Rail failures of this kind are not of infrequent occurrence, since lateral flow of the metal of the head, the result of wheel pressure, leads to this type of fracture. The immediate cause of the disturbance of the metal of the head is therefore the wheel pressures, but back of this is the matter of structural soundness of the steel, which is the vital feature in many instances and is the important one in the present rail. Sound steel will display a certain amount of ductility when tested by tension, and will display a greater amount when cold swagged, cold drawn, or cold rolled—that is, when its own strength is not called upon to cause the extension.

SEAMINESS RATHER THAN SEGREGATION

"In rails of medium hardness fins form along the sides of the head, illustrating the primitive ductility of the steel, the metal which forms these fins coming chiefly from the top of the head. Seaminess of the steel detracts from this ability to flow in a lateral direction, hence when the rail contains seamy metal in the head there is a tendency, when strained laterally, to develop incipient cracks which ultimately extend and finally result in split heads. If the surface metal is softer than that of the interior of the head, then such a condition in conjunction with seaminess increases the tendency to form split heads. The real danger, it would appear, has to do with seminess rather than segregation.

"The symmetrical arrangement of those marks which appear on the cross-section of etched rails and represent seaminess, place the responsibility for their presence on the state of the metal in the ingot. Investigation has shown that seaminess in the base has the same character as that which is found in the head, and certain base fractures are attributable to such seaminess. In the web, however, less trouble is experienced from this cause. An improvement in ingot conditions should effect an improvement in both the metal of the head and the base, and definite information should be acquired on the structural state of the metal in the ingot in a sufficient number of examinations to demonstrate fully the extent to which the causes of seaminess prevail, as well as what remedial measures can be adopted to prevent their recurrence.

"It is important, as a mill question, to remove the causes of seaminess, while in reference to track maintenance it is necessary to exercise diligent scrutiny in the detection of rails which are failing, and which present evidence of the same by surface indications. This rail apparently displayed evidence of a split head on the running surface prior to its complete failure, in showing a general increase in width, and also in exhibiting a dark line along the middle of the head, the latter being a feature which is commonly recognized as the visible indication of a split head. It so chanced that this was a relaid rail, but that circumstance is believed to have no direct bearing upon its failure.

"Briefly summarized, it is a desideratum that the causes of seaminess be eliminated from the ingot or elsewhere, if not confined to ingot conditions, but until there is assurance of the elimination of the causes of seams, reliance must be placed on track inspection for the detection and removal of rails having split heads. Since the depth of the seam in the head of a rail is many times its width, the detection of a split head is confined to evidence which is furnished by the lesser dimension of the seam, and such inspection becomes, essentially, a rigorous matter.

INITIAL STRAINS AND GAGGING EFFECTS

"This report contains further data upon the state of initial strains which affect rails. Rails are exposed to repeated alternate stresses, and it has been shown by laboratory tests that an increase in the fiber stresses of steel exposed to repeated stresses lowers its limit of endurance, which diminishes very rapidly when the loads attain certain limits, that is, when the fiber stresses approach the elastic limit of the metal. It is further known that the direct bending stresses of rails in the track are very high in comparison with the unit stresses which are deemed prudent to use in other engineering structures. The presence of initial strains from cooling during fabrication and those due to the cold rolling action of the wheels on the running surface of the head increase the total stresses of the rails when the wheels are in certain positions. Necessarily, these initial strains should be taken into consideration in judging of the strength and ability of the rails to endure the loads which are imposed upon them in the track. It does not appear, however, that such consideration has been given the subject.

"The present report also contains measurements on the initial strains in rails under normal conditions of cooling, when the rate of cooling was accelerated, when it was retarded, and strains present in annealed sections. The effects of gagging are also shown. The subject of gagging throughout the history of rail making has been a discursive theme, without attaining definite ends. In respect to the present results, the magnitudes of the initial strains in the gagged sections were found to be lower than those in the corresponding section which cooled normally. In the head, the normal condition of a state of compression was reversed and initial strains of tension were introduced. Laboratory tests of an early date showed such a reversal of strains would be expected as a result of gagging.

"The report invites attention to the distinction which should be made between the permanent sets of tension or compression which are given the rail by the process of gagging and the initial strains which result therefrom. A few observations were made on the transmission of stresses by heating one part of the rail, the head being shortened by rapidly heating the base. This temporary contraction of the metal of the head was, of course, lost when the temperature of the rail was equalized. The effects of sudden heating have a bearing upon the strains momentarily introduced in rails when 'wheel-burns' occur, as well as influencing the strains in brake shoes and the rims and plates of wheels. The transmission of strains occurs immediately, while a slower action attends the equalization of temperature."

The Sydvarangar iron-ore fields of Norway, regarded as practically inexhaustible but low in iron content, about 34 to 35 per cent, would be regarded as almost valueless were it not for the Grondal separating process, the results of which are now regarded as successful. The mines have at present a yearly capacity of about 650,000 tons of ore, and extensions in progress will permit the export of about 900,000 tons in 1918. In 1915 the mines produced 1,506,006 tons of crude ore and 600,000 tons of slig, a part of which was transformed into 267,000 tons of briquettes. Exports last year reached only 500,000 tons because of shipping difficulties, with the stock of slig, etc., at 500,000 tons at the end of the year.

The college of engineering, University of Wisconsin, Madison, has completed the installation of apparatus for testing automobile and aeroplane engines. The outfit consists of an electric dynamometer and a gas engine manograph. The dynamometer has a capacity of 150 hp. at from 220 to 3500 r.p.m. The college will conduct experiments in co-operation with various manufacturers in Wisconsin.

Judicial Decisions

ABSTRACTED BY A. L. H. STREET

WARRANTY IN SALE OF IRON ORE.—Where a written contract was made for sale of iron ore, without the incorporation of any warranty concerning the percentage of manganese to be present in the ore delivered, the buyer could not rely upon any verbal statement which may have been made on that point in the negotiations leading up to the making of the agreement. When a written contract is upon its face couched in such terms as import a complete legal obligation, without any uncertainty as to the object or the extent of the engagement, it is conclusively presumed that the whole engagement of the parties and the extent and manner of their undertaking were reduced to writing in the contract. (United States Circuit Court of Appeals, Sixth Circuit, Hamilton Iron & Steel Company vs. Groveland Mining Company, 233 Federal Reporter, 388.)

DAMAGES FOR BREACH OF CONTRACT TO MANUFACTURE MACHINERY.—In an action by a jobber of machinery to recover damages for claimed breach of contract for the manufacture and delivery of machinery, it is decided that, as a general rule, the damages to be recovered for breach of any business contract are limited to those which follow as a natural and direct consequence of the breach, and which may reasonably be supposed to have been contemplated by both parties at the time the agreement was entered into, not including loss of speculative profits. That is, no damages may be assessed against the manufacturer on account of supposed loss of profits which the buyer might have made on uncertain resales. But it appearing that the manufacturer was advised when the contract was entered into that the buyer had placed the contract to provide machinery to fill orders from third persons, the manufacturer, if in default in deliveries, must reimburse the buying jobber for profits actually lost. This rule would not apply, however, if the buyer could readily supply his needs by buying the necessary machinery elsewhere at a price which would reduce the damage. In such case the buyer would be bound to minimize his loss, and could not recover more than the excess of the price paid elsewhere to obtain the necessary machinery, above what the defaulting manufacturer agreed to sell it for. (Missouri Supreme Court, Weber Implement Company vs. Acme Harvesting Machine Company, 187 Southwestern Reporter, 874.)

German Steel Shipments Lower

The shipments of the German Steel Works Union for July, 1916, were 282,875 metric tons, against 298,753 tons in June and 258,092 tons in July, 1915. They were made up of 69,386 tons of semi-finished steel, 130,465 tons of railroad material and 83,024 tons of shapes. The July shipments were next to the lowest for 1916, with the average of July 1 at 293,471 tons per month. The 1915 monthly average was 270,510 tons.

The Eastern Car Company, Halifax, N. S., has completed its first contract for 1000 cars for France and expects to begin delivery next month on the second French order, calling for 3000 cars. Work is also being commenced on 500 freight cars for the Canadian Government Railways. The company is negotiating for a contract to build 4000 cars for another foreign government.

The plant of the Washington Steel & Iron Company, Leavenworth, Wash., which has been unsuccessful in its efforts to manufacture steel direct from ore, is to be dismantled and sold, according to O. C. Moore, Spokane, secretary of the company. The plant was built several years ago.

The Homestead Valve Mfg. Company, Pittsburgh, has appointed the O. C. Keckley Company, 608 South Dearborn Street, Chicago, as Western representative, having charge of the sale of Homestead valves in parts of Illinois, Iowa and Wisconsin.

An Offer to Buy Thomas Iron Company

At a meeting of the stockholders of the Thomas Iron Company, Easton, Pa., on Sept. 12, an offer of $3,500,000 for the company's blast furnace, ore, railroad and other properties was made by Dr. H. D. Heller, representing a syndicate in which are said to be Philadelphia, New York and Baltimore interests. Dr. Heller is a stockholder in the company and at his request a committee of stockholders was appointed to meet the intending buyers to carry on the negotiations. Dr. Heller was made chairman of this committee. The syndicate, it is said, is headed by William H. Bilyeu, vice-president of the Northern National Bank of Philadelphia, and R. L. Pierson of Philadelphia. It is reported to be the purpose of the syndicate to spend considerable money in improving the property. The price stated would pay off outstanding obligations of the company and net the stockholders upwards of $2,500,000 or somewhat over par, which is $50 a share. Until its presentation at last week's meeting nothing was known of the impending liberal offer, either by the management or by any of the larger stockholders of the company.

At the organization meeting of the newly elected directors of the Thomas Iron Company held at Easton, Pa., Sept. 14, Walter A. Barrows, Jr., was elected president and general manager; Major Fred R. Drake, vice-president; Oliver T. Case, secretary, and L. K. Diffenderfer, treasurer. The directors are Fred R. Drake, J. Samuel Krause, Thomas E. Ritter, Edwin Thomas, A. D. Chidsey, J. Mark Mauser, David E. Steckel and Walter A. Barrows, Jr. Major Drake succeeds Edwin Thomas as vice-president.

French Iron and Steel Imports

The principal imports of iron and steel into France during the last three years are given as follows in metric tons:

	1915	1914	1913
Pig iron	166,709	15,885	32,669
Blooms, billets and bars	580,430	16,888	19,379
Iron and steel (machine stock)	64,831	5,160	6,903
Iron and steel plates	76,230	5,652	13,760
Tin plates	68,340	24,878	19,460
Iron and steel wire	44,511	7,407	6,088
Rails	40,658	547	1,792

In 1915 England furnished 677,560 tons of the total; the United States, 143,770 tons, and Spain, 65,510 tons. In 1914 and 1913 the United States supplied only 3217 tons and 2991 tons, respectively, of the totals.

Large Order for Locomotives

The New York Central has ordered 230 locomotives, for delivery in the last quarter of 1917, the American Locomotive Company to furnish 115 of these and the Lima Locomotive Corporation, 115. The New York, Chicago & St. Louis has ordered 10 Mikado locomotives from the Lima Locomotive Corporation. The New York, New Haven & Hartford Railroad is inquiring for 28 Santa Fé locomotives and the Pere Marquette for 13 locomotives.

Implement Makers' Convention

The National Implement and Vehicle Association will hold its twenty-third annual convention at the Hotel Traymore, Atlantic City, N. J., Oct. 18, 19 and 20. The sessions of each day will be from 9 to 12 o'clock and from 2 to 4. The program is one of unusual interest and speakers of national repute on industrial and agricultural questions have been provided. The annual dinner is set for Friday night, Oct. 20.

At a meeting of the board of directors of the Carbon Steel Company, Pittsburgh, Sept. 19, dividends of 6 per cent were declared on the second preferred stock and 6 per cent on the common stock, both payable in full Sept. 30 to stock of record Sept. 25. Last June this company declared a dividend of 8 per cent on the first preferred stock, 4 per cent of which was paid July 5 last and the other 4 per cent will be paid Jan. 5 next.

Iron and Steel Markets

TENDENCY STILL UPWARD

Demand for Steel Is Unflagging

Railroad and Shipyard Buying for Delivery Late in 1917 and Early in 1918

The drift of the steel trade is toward higher prices and greater difficulties in delivery. In brief, the situation is that Europe will take whatever amount of steel American mills will agree to deliver when wanted, and that domestic buyers are providing for their wants in the first half of 1917 at prices they were unwilling to consider two months ago.

Consumers are acting on the more definite signs that with the war prolonged through 1917 the steel works of the country will continue to have to choose between buyers. A significant case is the buying of 230 locomotives by the New York Central. Deliveries are not wanted before the last quarter of 1917. Locomotive works could build them earlier, but the railroad looked rather to the steel situation and to the large impending foreign orders.

The placing here of 1000 locomotives and thousands of cars for Russia is a matter of a short time and the car requirements of France and Italy are put at 20,000 to 30,000. In the home market about 7000 are to be bid on, of which 2500 are for the Missouri Pacific, 2000 for the Western Maryland and 2000 for the M., K. & T. Of 5000 just placed, 3000 are for the New York Central and the seller of these has covered for steel for the second quarter of 1917.

To what pass the plate situation is coming is seen in the placing of three vessels at a Pacific Coast yard for the first quarter of 1918, or nearly 18 months ahead. On large lots of plates for delivery in the first half of next year as high as 4c. has been quoted. Including 68,000 tons on which the Government took bids this week, nearly 300,000 tons of plates have been before the mills lately in the effort to make sure of deliveries when wanted.

Building suffers less from high prices. August contracts took up 64 per cent of a month's capacity of bridge and structural works, against 47 per cent in July. Steel company additions are still taking a large tonnage. For a Chester, Pa., power house 6000 tons is wanted and 7500 tons for the Thames River bridge of the New Haven Railroad.

France offers 35,000 tons of rails here, but is not likely to get the deliveries wanted. At Pittsburgh a road that covered its supposed needs for 1917 has just ordered 15,000 tons more, taking Bessemer rails, as open-hearth could not be had. Chicago rail inquiries represent 8000 tons. In the Central West an industrial company has been quoted $50 on 800 tons of standard sections. There is great activity in light rails, and discard steel is finding a large outlet in this form. An 8000-ton sale was made for export.

Scarcity in wire and tin plate is indicated, both having been sold in a large way for export. Woven wire fence has been advanced about $2.50 per ton. Tin plate mills have made large sales for the first half of 1917 and will have a large carry-over from this year. Contracts are made with the price to be fixed later, probably $5.50 per box.

The Pearson oil interests are in the market for 100 miles of 6-in. line pipe. The recent advance in wrought pipe followed liberal contracting at the last price.

Steel billet and sheet bar contracts for the fourth quarter, it now appears, will be at $5 a ton above the third quarter basis, though some belated deliveries will be made in October and November at the old price. Northern Ohio sheet mills are in the market. One Cleveland sheet mill, recently finished, will not start in view of the high level for raw material.

Cast iron pipe, usually a laggard even with pig iron moving up, has advanced $1 a ton.

With other markets quieter, Chicago reports the heaviest buying of pig iron since the movement began. Some good export sales were included and the total for the district since Sept. 1 is put at 250,000 tons. Prices are firmer in Central Western districts. The smaller foundries are beginning to come in as the bargains on which the movement started disappear.

Basic iron sales in 5000, 10,000 and 20,000-ton lots at Pittsburgh have strengthened that market, which is probably 25 cents higher. Exports of Bessemer iron bid fair to run on indefinitely. A round lot of basic iron is before the Eastern market.

British makers of 80 per cent. ferromanganese are meeting prices recently made by domestic sellers and as low as $164 has been done, as against $175 on the last contracts.

Pittsburgh

PITTSBURGH, PA., Sept. 19, 1916.

The market is steadily gaining strength, both in demand and prices, and indications point to higher values on pig iron, semi-finished steel and finished material before the end of the year. Consumers have accepted the situation and have decided that there is no use in holding off any longer in covering their needs for the next six or nine months; as a result, they are placing orders freely and at prices which they refused to consider a month or two ago. The mills are getting more and more congested with orders, and the matter of price is cutting very little figure. The larger steel mills state that their chief trouble is to try to make their output go around and come anywhere near satisfying their customers. It is a wonderful condition that now exists in the steel trade. Mills are turning down orders every day at prices that would give them enormous profits, but they cannot take the business and make the deliveries. There is a shortage in supply of semi-finished steel, plates, plain structural material, wire nails, tin plate, lap weld pipe and seamless tubing, and on some other lines. Indications are there will not be enough wire nails, tin plate and one or two other

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Sept. 20, 1916.	Sept. 13, 1916.	Aug. 23, 1916.	Sept. 22, 1915.
No. 2 X, Philadelphia	$19.50	$19.50	$19.50	$16.25
No. 2, Valley furnace	18.50	18.50	18.25	14.75
No. 2 Southern, Cin'ti	17.40	17.40	16.40	14.40
No. 2, Birmingham, Ala.	14.50	14.50	13.50	11.50
No. 2, furnace, Chicago*	18.00	18.00	18.00	14.25
Basic, del'd, eastern Pa.	19.75	19.75	19.00	17.25
Basic, Valley furnace	**18.25**	18.00	18.00	15.00
Bessemer, Pittsburgh	**22.20**	21.95	21.95	16.95
Malleable Bess., Ch'go*	19.00	19.00	19.00	15.00
Gray forge, Pittsburgh	**18.95**	18.70	18.70	14.70
L. S. charcoal, Chicago	19.75	19.75	19.75	15.75
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh	45.00	45.00	45.00	24.50
O.-h. billets, Pittsburgh	45.00	45.00	45.00	25.00
O.-h. sheet bars, P'gh	45.00	45.00	45.00	25.50
Forging billets, base, P'gh.	69.00	69.00	69.00	32.00
O.-h. billets, Phila	48.00	48.00	46.00	30.00
Wire rods, Pittsburgh	55.00	55.00	55.00	30.00
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47½	1.47½	1.47½	1.25
O.-h. rails, heavy, at mill	1.56½	1.56½	1.56½	1.34
Iron bars, Philadelphia	2.659	2.659	2.659	1.509
Iron bars, Pittsburgh	2.60	2.60	2.60	1.35
Iron bars, Chicago	2.35	2.35	2.35	1.35
Steel bars, Pittsburgh	2.60	2.60	2.60	1.35
Steel bars, New York	2.769	2.769	2.769	1.519
Tank plates, Pittsburgh	4.00	4.00	4.00	1.35
Tank plates, New York	4.169	4.169	4.169	1.519
Beams, etc., Pittsburgh	2.60	2.60	2.50	1.35
Beams, etc., New York	2.769	2.769	2.669	1.519
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.35
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.40
Steel hoops, Pittsburgh	3.00	3.00	3.00	1.35

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,	Sept. 20, 1916.	Sept. 13, 1916.	Aug. 23, 1916.	Sept. 22, 1915.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	2.90	2.90	2.90	1.90
Galv. sheets, No. 28, P'gh.	4.15	4.15	4.15	3.50
Wire nails, Pittsburgh	2.60	2.60	2.60	1.75
Cut nails, Pittsburgh	2.60	2.60	2.60	1.60
Fence wire, base, P'gh.	2.55	2.55	2.55	1.60
Barb wire, galv., P'gh	3.45	3.45	3.45	2.60
Old Material, Per Gross Ton:				
Iron rails, Chicago	**19.25**	18.75	18.50	13.50
Iron rails, Philadelphia	20.00	20.00	20.00	18.50
Carwheels, Chicago	11.75	11.75	11.50	11.75
Carwheels, Philadelphia	15.50	15.50	15.50	14.00
Heavy steel scrap, P'gh.	**16.25**	16.00	16.00	14.25
Heavy steel scrap, Phila.	14.75	14.75	14.75	15.00
Heavy steel scrap, Ch'go.	**16.25**	16.00	15.25	11.75
No. 1 cast, Pittsburgh	14.50	14.50	14.50	13.00
No. 1 cast, Philadelphia	16.00	16.00	16.00	14.00
No. 1 cast, Ch'go (net ton)	**12.25**	12.00	11.50	10.00
No. 1 RR. wrot, Phila.	20.00	20.00	20.00	16.50
No. 1 RR. wrot, Ch'go (net ton)	16.50	16.50	15.25	11.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.85	$2.90	$2.85	$1.60
Furnace coke, future	**2.75**	2.50	2.50	2.00
Foundry coke, prompt	3.25	3.25	3.25	2.15
Foundry coke, future	3.50	3.50	3.50	2.40
Metals,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	**28.25**	28.00	27.25	17.87½
Electrolytic copper, N. Y.	**28.50**	28.12½	26.87½	17.75
Spelter, St. Louis	**9.50**	9.00	9.50	13.00
Spelter, New York	**9.75**	9.25	9.75	13.25
Lead, St. Louis	**6.85**	6.60	6.50	4.32½
Lead, New York	**7.00**	6.75	6.62½	4.50
Tin, New York	**38.50**	38.25	38.50	33.00
Antimony, Asiatic, N. Y.	11.00	11.00	13.50	27.50
Tin plate, 100-lb. box, P'gh	$5.75	$5.75	$6.00	$3.15

products to meet the consumptive demand this winter, while in plates there has practically been a famine for some months. Pig iron, which was quiet for so long, has become very active, and the long expected advance in Bessemer and basic has come, both grades being at least 25c. per ton higher, with some sellers quoting $1 per ton higher than a month ago. Prices on semi-finished steel will be at least $5 per ton higher on contracts for billets and sheet bars in the last quarter than in the present quarter. Advances are looked for in sheets, wire goods, pipe and other products for which the demand is far greater than the supply. Scrap, which has been demoralized for some time, is showing more strength and prices are firmer. The coke market is fairly active for spot, which is readily bringing $2.85 to $2.90 at oven for prompt shipment. The output of semi-finished and finished steel this month will be heavier than in August, but the larger steel mills claim it will be at least two or three months before they are able to catch up to any extent on their accumulation of orders.

Pig Iron.—The local market has been very active and prices on Bessemer and basic are up from 25c. to 50c. per ton. A consumer in the Wheeling district has bought upward of 20,000 tons of basic iron from five or six different furnaces, 1000 tons for January and 3500 to 4000 tons each month, Feb. to June, inclusive, at prices that averaged about $18.25, Valley furnace. It is confirmed that the United Steel Company has bought 20,000 tons of basic for next year. The West Leechburg Steel Company has bought about 5000 tons of basic for first half of 1917 on the basis of about $18 or slightly higher, Valley furnace. The Colonial Steel Company is in the market for 5000 tons of basic and the Mesta Machine Company for 3000 tons of Bessemer for first half of next year. We note a sale of 2000 tons of low phosphorus basic to an Eastern consumer at $18.50, Valley furnace. We also note sales of small lots of Bessemer, 2000 tons or more, at $21.25 to $21.50, Valley furnace. On an inquiry for 1000 tons of standard Bessemer for first four months of next year, one furnace quoted as high as $22, Valley, and would not shade that price. There is still a fairly large lot of Bessemer and basic iron to be bought, and it is believed this will bring $18.50 for basic and $21.50 or higher for Bessemer at Valley furnace. We note a sale of 2000 tons of malleable Bessemer iron at $18.50, Valley furnace. A local consumer has bought 4000 tons of No. 2 foundry for first half at $18.50 and another 2000 tons for the same delivery at the same price. We note other sales of No. 2 foundry, all for first half delivery, of close to 5000 tons at $18.75, Valley furnace. On Oct. 1 the export rate on pig iron from the valleys to New York will be increased from $2.14 to $2.98 per ton, and this will likely act against much export business in Bessemer and foundry iron being placed with Valley furnaces. We quote standard Bessemer iron, $21.25 to $21.50; basic, $18.25 to $18.50; No. 2 foundry, $18.50 to $18.75; malleable Bessemer, $18.50 to $18.75, and gray forge, $18 to $18.25, all at Valley furnace, the freight to the Pittsburgh and Cleveland districts being 95c. per ton.

Later.—The Colonial Steel Company, Pittsburgh, has bought 5000 tons of basic for delivery in the first half of next year at $18 or slightly higher, Valley furnace, and 2000 tons of Bessemer, same delivery, at about $21. The Shenango Furnace Company, which has been furnishing upward of 900 tons of molten Bessemer per day from its furnaces at Sharpsville to the Valley Mold & Iron Company at the same place, has arranged with M. A. Hanna & Co., Cleveland, to secure about 27,000 tons of molten Bessemer from their Claire furnace at Sharpsville for the Valley Mold Company, as the latter may need it all for the manufacture of ingot molds.

Billets and Sheet Bars.—It now develops that the advance in prices on 4 x 4-in. billets and sheet bars to consumers contracting for the fourth quarter of this year will be from $5 to $7 per ton, instead of about $3, as recently suggested. The leading steel interest has already fixed its prices for fourth quarter, and its minimum price for that delivery will not be less than $45, and, in some cases, probably as high as $47. Consumers seem willing to pay this heavy advance if they are assured of getting a supply as fast as they need

the steel. One large consumer is said to have offered $50 for 1500 tons additional of sheet bars for delivery in the last three months to a mill that has a contract for its full supply. Recently a large steel company shipped a good sized quantity of small billets to a concern, but through an error the carbons in these ran 0.15 and higher, while the consumer wanted 0.10. The maker of the steel quickly found a buyer for it at $2 per ton higher than the original customer was to pay. This is cited as showing the scarcity of steel and the indifference of consumers as to prices charged if they can get it. We quote soft Bessemer and open-hearth steel billets and sheet bars at $45 to $50 at mill, Youngstown or Pittsburgh, and the lower price would be readily paid by consumers if they could find steel at that figure. We quote forging billets at $69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 extra.

Ferroalloys.—Ferromanganese is lower. Foreign and domestic are being offered at about $164 per ton, seaboard, equal to $166.65, Pittsburgh, the freight being $2.65 per ton. It is probable that some grades of domestic could be bought at about $160 per ton on a firm offer. We quote 18 to 22 per cent spiegeleisen at $40 to $45, and 25 to 30 per cent $55 to $65, at furnace. On 50 per cent ferrosilicon we quote $88 to $89 in lots up to 100 tons; over 100 tons, $87 to $88, and over 600 tons, $86 to $87, all per gross ton, f.o.b. Pittsburgh. We quote Bessemer ferrosilicon as follows: 9 per cent, $30; 10 per cent, $31; 11 per cent, $32; 12 per cent, $33; 13 per cent, $34.50; 14 per cent, $36.50; 15 per cent, $38.50, and 16 per cent, $41. Seven per cent silvery is $28.50; 8 per cent, $29; 9 per cent, $29.50; 10 per cent, $30; 11 per cent, $31, and 12 per cent, $32. These prices are f.o.b. furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky., all having a freight rate of $2 per gross ton to Pittsburgh.

Steel Rails.—Some time ago a leading railroad covered on its supply of open-hearth steel rails for 1917 delivery, but later found it had not bought enough. It first sent out an inquiry for 10,000 tons more and later increased it to 15,000 tons, and a contract for the latter amount of Bessemer steel rails has been placed with the Carnegie Steel Company for delivery in last half of next year. This was the very best delivery that the road could get on its inquiry, and it was forced to accept Bessemer rails in place of open-hearth. The Hocking Valley is in the market for 5000 tons for next year, and several other roads for smaller amounts. The Carnegie Company is now quoting on standard sections only for delivery in last quarter of next year, its present obligations taking its entire output of standard sections through the third quarter. The new demand for light rails is not very active. Several makers of light rails have been using discard steel in making them, as it is well adapted for that purpose. A leading rerolling mill recently took a contract for 8000 tons of light rails for export, and it is said secured about $3 a ton higher than the domestic price. We quote 25 to 45 lb. sections at $47; 16 and 20 lb., $48; 12 and 14 lb., $49, and 8 and 10 lb., $50, in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at 1.47½c. and of open-hearth 1.56½c., Pittsburgh.

Plates.—There is more new inquiry for steel cars and some contracts have been booked. The New York Central has placed 2000 box cars with the American Car & Foundry Company, 1000 with the Pressed Steel Car Company, 1000 with the Haskell & Barker Car Company and 1000 steel gondolas with the Standard Steel Car Company. It is also said to be in the market for 230 or more locomotives. The Soo Line has bought 250 steel ore cars from the Haskell & Barker Car Company, and the Bethlehem Steel Company has bought 30 steel hoppers from the Pressed Steel Car Company. The minimum mill price on ¼-in. and heavier plates is 3c. at mill for delivery in first quarter and first half of next year. One leading local plate mill is out of the market on any plates for delivery before the second quarter of 1917. For delivery in two to four months ¼-in. and heavier plates are quoted from 3.75c. to 4c. and higher at mill.

Structural Material.—In spite of the high prices and the delay in getting deliveries, new inquiry is active. Considerable work is being placed. The American Bridge Company has taken 2300 tons for extensions to the open-hearth building of the American Rolling Mill Company, Middletown, Ohio; 750 tons for two barges for the Aluminum Ore Company to transport ore from Arkansas to the smelter of the Aluminum Company of America in East St. Louis, Ill., and 600 tons for coal-handling towers for the Carnegie Steel Company at Clairton, Pa. Mill prices on beams and channels up to 15-in. remain at 2.60c. to 2.75c. at mill for such deliveries as the mills can make, which would not be before next year, while small lots from stock for fairly prompt shipment bring 3c. to 3.25c., Pittsburgh.

Sheets.—As it is evident that some sheet mills will have to pay at least $5 per ton more for sheet bars for fourth quarter delivery than they are paying for third quarter, this is expected to be reflected soon in higher quotations on sheets by these mills. However, deliveries on contracts for sheet bars that should have been made in this quarter will drag along into October and November, and of course these sheet bars will be furnished at the third quarter price. There is still a heavy export demand for galvanized and blue annealed sheets and prices on all grades are firm. We quote Nos. 9 and 10 blue annealed sheets at 2.90c. to 3c., for delivery at convenience of the mill. No. 28 Bessemer and open-hearth black sheets, 2.90c. to 3c.; No. 28 galvanized, Bessemer, and open-hearth, 4.15c. to 4.25c.; Nos. 22 and 24 black plate, tin-mill sizes, H. R. & A., 2.90c.; Nos. 25, 26 and 27, 3c. to 3.10c.; No. 28, 3.10c. to 3.15c., and No. 29, 3.20c. to 3.25c. These prices are for carloads and larger lots, f.o.b. mill, Pittsburgh.

Tin Plate.—The new demand is much beyond the capacity of the mills to supply and all will carry over into 1917 orders for a very large amount of tin plate that should have been delivered this year. Large quantities have been sold for delivery in the first quarter and first half of 1917, mostly to the Pacific coast trade, no price having been stipulated, but the price is to be the same as that agreed upon by the mills for the first half of 1917, and which is likely to be about $5.50 per base box for 108 lb., 14 x 20 bright plate. The demand from Russia, France and Italy is very heavy, one inquiry a few days ago being for 100,000 boxes for Russia on which payments were guaranteed in this country. A leading mill booked in one day last week 135,000 boxes for delivery in the first quarter of next year, the price to be fixed later. It is evident that the tin-plate mills will run to their utmost capacity for many months. To regular customers mills are quoting tin plate from stock at $5.50, while production tin plate is quoted at $5.75 and up to $6 to the domestic trade. For export, $6 to $6.25 per base box is quoted. We quote 8-lb. coated ternes at $8.50 to $8.75 for 200 lb., and $8.75 to $9 for 214 lb., Pittsburgh.

Rivets.—Most consumers are covered over the remainder of the year and are specifying freely, while the export demand is reported to be quite heavy. Some jobbers who have stocks of rivets bought when prices were lower than they are now are cutting makers' prices to some extent. Makers' quotations are as follows: Buttonhead structural rivets, ½ in. in diameter and larger, $4 per 100 lb., base, and conehead boiler rivets, same sizes, $4.10 per 100 lb., base, f.o.b. Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

Railroad Spikes and Track Bolts.—The new demand for track bolts is reported fairly active, with prices ruling firm, but for railroad spikes is dull, and specifications against contracts from the railroads are quiet. In fact, the new demand for railroad spikes has been the dullest of any of the finished steel lines for some months. We quote track bolts with square nuts at 4.50c. to 4.75c. to railroads and 5c. to 5.25c. in small lots to jobbers, base. Track bolts with hexagon nuts take the usual advance of 15c. per 100 lb. Prices on

railroad spikes, which are only fairly strong, are as follows:

Standard railroad spikes, 4½ x 9/16 in. and larger, $2.65 to $2.75; railroad spikes, ½ and 7/16 in., $2.75 base; railroad spikes, ⅜ in. and 5/16 in., $3.05 base; boat spikes, $2.80 base, all per 100 lb., f.o.b. Pittsburgh.

Cold-Rolled Strip Steel.—None of the mills has yet opened books for contracts for the first half of 1917, but some will likely do so about Oct. 1. We note contracts in the past week for 300 to 400 tons for delivery this year at $6 per 100-lb. base. We quote cold-rolled strip steel at $6 base on contracts for delivery over the remainder of the year, and $6.50 to $6.75 in small lots for fairly prompt shipment. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

Wire Rods.—The demand is heavy and there is a scarcity in the supply. Several local makers of rods are refusing to quote on export inquiries, stating that demands of regular customers will more than take the entire supply of rods they have over their own needs. We quote soft Bessemer, open-hearth and chain rods at $55 to $60 per ton, f.o.b. Pittsburgh, but to some consumers, $50 per ton has been named in contracts where the rods go into products that come in competition with mills that make their own rods.

Nuts and Bolts.—The new demand is reported fairly active and prices are very firm. Most consumers are covered over the remainder of the year and makers are back in deliveries eight to ten weeks or longer. The export demand is strong, and considerable shipments of nuts and bolts are being made to Russia, England, South America and elsewhere. The discounts are as follows, delivered in lots of 300 lb. or more, where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 5 per cent; small, cut thread, 40, 10 and 5 per cent; large, 35 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50 per cent; large, 40 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 and 10 per cent; large, 35 per cent. Blank bolts, 40 and 5 per cent. Bolt ends, h. p. nuts, 40 and 5 per cent; with c. p. nuts, 35 per cent. Rough stud bolts, 15 per cent. Lag screws (cone or gimlet point), 50 and 5 per cent.

Forged set screws and tap bolts, 10 per cent. Cup and round point set screws, case-hardened, 60 per cent. Square or hexagon head cap screws, 55 per cent. Flat, button, round or fillister head cap screws, 30 per cent.

Nuts, h. p. sq., tapped or blank, $2.70 off list; hex., $2.70 off. Nuts, c. p. c. and t. sq., tapped or blank, $2.40 off; hex., $2.80 off. Semi-finished hex. nuts, 60 and 5 per cent. Finished and case-hardened nuts, 60 and 5 per cent.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 5 per cent.

Iron and Steel Bars.—For such deliveries as they can make on steel bars, the mills are holding firmly for the 2.60c. price and state they are booking heavy contracts at this figure for delivery through the first half of next year. Steel rounds for shrapnel are still being made very largely by the Carnegie Steel Company at Bessemer, Youngstown and other plants, and also by other mills. Most of the large contracts for steel bars have been placed by the leading consumers, but the current demand for both iron and steel bars is heavy and mills are back in deliveries 8 to 10 weeks or longer. We quote merchant steel bars at 2.60c. at mill, for delivery at convenience of the mill, which would be in last quarter of this year or first quarter of 1917; while for prompt shipment from warehouse, 3c. to 3.10c. is quoted. We quote refined iron bars at 2.60c. to 2.70c., and railroad test bars, 2.70c. to 2.80c., f.o.b. Pittsburgh.

Wire Products.—Makers predict a famine in the supply of wire nails this fall and winter, and possibly also in barb wire, on the latter due to the large purchases by Russia and other foreign countries. Buyers are specifying heavily against contracts for wire nails, plain wire and barb wire, but fence wire is dull, farmers refusing to pay the high prices. In spite of this latter fact, the discounts on woven wire fencing were lowered last week (price advanced), making the discount on carload lots 60 per cent off. Nearly all the contracts for wire nails on which the mills are now working are on the $2.50 basis, but they have also received good orders on the $2.60 price, which is very firmly held. Prices to the large trade are as follows: Wire nails, $2.60, base, per keg; galvanized, 1 in. and longer, including large head barbed roofing nails, taking an advance over this price of $2, and shorter than 1 in., $2.50. Bright basic wire is $2.65 per 100 lb.; annealed fence wire, 6 to 9, $2.55; galvanized wire, $3.25; galvanized barb wire and fence staples, $3.45; painted barb wire, $2.75; polished fence staples, $2.75; cement-coated nails, $2.50, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing remain at 60 per cent off list for carload lots, 59 per cent for 1000-rod lots and 58 per cent for small lots, f.o.b. Pittsburgh.

Shafting.—Two leading makers say they have not yet opened their books on contracts for delivery in the first quarter and first half of 1917, but will likely do so early in October. Several others have already booked contracts from automobile builders and the screw stock machine trade for the first quarter at about 20 per cent off and smaller contracts for the same delivery at 15 per cent off. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

Merchant Steel.—Mills report the new demand heavy, and say that, in spite of the fact they are turning out more product than ever before, they are not able to catch up on back deliveries to any extent. It is said that several contracts for some grades of merchant steel have been made for delivery through the first half of 1917 at prices very close to $10 per ton higher than are ruling at present. The output this month is expected to show an increase over August. We quote: Iron finished tire, ½ x ½ in. and larger, 2.60c., base; under ½ x 1½ in., 2.75c.; planished tire, 2.75c.; smooth channel tire, ¾ to ⅞ and 1 in., 2.85c. to 2.90c.; 1⅛ in. and larger, 3.10c.; toe calk, 3.10c. to 3.15c., base; flat sleigh shoe, 2.75c.; concave and convex, 2.85c.; cutter shoes tapered or bent, 3.25c. to 3.35c.; spring steel, 3.25c. to 3.50c.; machinery steel, smooth finished, 2.90c. to 3c., all f.o.b. at mill.

Hoops and Bands.—While most consumers have covered their needs for the remainder of this year, one leading maker has so far refused to sell for delivery into 1917. The current demand is fairly active and specifications against contracts are heavy. Steel hoops are firm at 3c. and bands at 2.60c., with extras on the latter as per the steel bar card.

Wrought Pipe.—It is reported that the Pearson oil interests are in the market for 100 miles of 6-in. pipe for a line from the Oklahoma fields to Fort Worth, Texas. The company desires to lay this line this year, but may have trouble in finding a mill that can make the delivery. The recent advance in prices is being firmly held, but it is said most of the trade bought for several months ahead prior to this advance. Mills are sold up on lap-weld pipe, both galvanized and black, five to six months ahead, but on butt-weld sizes they can make deliveries in two to three weeks. Discounts on black and galvanized iron and steel pipe are given on another page.

Boiler Tubes.—The new demand for both locomotive and merchant tubes is very heavy and mills are sold up for five to six months or longer. The recent advance in prices is firmly held. Discounts now in effect are given on another page.

Coke.—There is still quite an active demand for blast-furnace coke, the supply of which is limited on account of labor shortage in the coke regions, and best grades for prompt shipment are held at $2.85 to $2.90 per ton at oven. Some sellers are asking $3 for prompt blast-furnace coke, and also ask this price for delivery over the remainder of the year. We quote $2.75 to $3 per net ton at oven on contracts. We quote best grades of 72-hr. foundry coke for spot shipment at $3.25 to $3.50, and on contracts $3.50 to $3.75, per net ton at

oven. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended Sept. 9 as 384,374 net tons, a decrease from the previous week of 16,736 tons.

Old Material.—The undertone of the local scrap market is decidedly better, and a buying movement by large consumers is expected in the near future. Prices on selected heavy melting steel scrap are firm, small lots changing hands between dealers at $16.25 to $16.50. The Carnegie Steel Company states it is not in the market for heavy steel scrap at any price. Borings and turnings are dull and prices somewhat demoralized. There have been no important sales in the past week. Prices quoted by dealers for delivery in Pittsburgh and points that take the same rates of freight, per gross ton, are as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	$16.25 to $16.50
No. 1 foundry cast	14.50 to 14.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.50 to 17.00
Hydraulic compressed sheet scrap	13.50 to 14.00
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	11.25 to 11.50
Bundled sheet stamping scrap	10.25 to 10.50
No. 1 railroad malleable stock	14.50 to 14.75
Railroad grate bars	10.25 to 10.50
Low phosphorus melting stock	19.75 to 20.00
Iron car axles	28.00 to 28.50
Steel car axles	28.00 to 28.50
Locomotive axles, steel	33.00 to 35.00
No. 1 busheling scrap	14.00 to 14.25
Machine-shop turnings	7.00 to 7.25
Old carwheels	13.25 to 13.50
Cast-iron borings	8.00 to 8.25
*Sheet bar crop ends	17.00 to 17.50
No. 1 railroad wrought scrap	18.00 to 18.75
Heavy steel axle turnings	10.50 to 10.75
Heavy breakable cast scrap	12.25 to 12.50

*Shipping point.

Chicago

CHICAGO, ILL., Sept. 18, 1916.

Heavy selling of pig iron, plates, shapes and bars has characterized the past week. Sales of pig iron by local interests for export and domestic consumption will easily total 250,000 tons since Sept. 1. The amount of steel-making iron sold for export has now reached a figure that has a direct bearing on the strength of this market and the only problem of unsold tonnage which any of the furnaces are facing has to do with the last quarter of the year. Orders for steel bars, totaling more than 25,000 tons, and for shapes and plates about the same quantity, represent new contracts entered into by fabricators in the week, while a local jobber placed an additional order for 20,000 tons of plates and bars. It is significant that much of the above structural steel and bar business was taken by mills on the basis of 2.50c., Pittsburgh, while the plates were booked on the basis of 3c. In contrast, various mills report sales of shipbuilding plates for delivery up to July, 1917, at 4c., Pittsburgh. In general specifications are very heavy, greatly exceeding shipments. Even new business is not less than daily production which has now materially improved with the advent of cool weather. The scrap market presents evidence of an interesting effort to raise the level of prices, regardless of demand. The fact that old material values have been disproportionately low, while unusually small quantities of scrap are coming on the market, is contributing to the success of this endeavor.

Pig Iron.—Last week witnessed the heaviest buying of pig iron thus far recorded in the present movement. A considerable part of the iron taken is standard Bessemer for export, the Iroquois furnaces having been booked freely on this iron while another maker of Bessemer has withdrawn from the market for the remainder of the year. Sales of steel-making iron now clearly constitute a strengthening influence in the market. Malleable, basic and strong Northern foundry iron, 2.25 per cent and over in silicon, are held at $19 at the furnace; Northern foundry 1.75 per cent and over in silicon can be had at $18.50, while high phosphorus Northern irons continue to be quoted on a basis competitive with Southern iron. Since the closing of recent sales of 6000 tons and 2000 tons to Iowa interests, there has been little activity in basic iron, while malleable sales are also relatively small. The principal activity has been in foundry iron, and as yet very little falling off in the amount of inquiry is noticeable. An active selling of charcoal iron is also reported. The ruling prices for Southern iron are less clearly established. It is known that $18, Chicago, was done on Northern iron competing against a Southern quotation last week and also that a Southern furnace sold high phosphorus iron, taking advantage of a favorable freight, on the basis of $18.25, Chicago, while another large interest was soliciting, for immediate acceptance, a limited amount of business on the basis of $14.50, Birmingham. Others of the Southern producers have advanced their quotations to $15. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of $1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	$19.75
Lake Superior charcoal, No. 1	20.25
Lake Superior charcoal, No. 6 and Scotch	20.75
Northern coke foundry, No. 1	$19.00 to 19.50
Northern coke foundry, No. 2	18.00 to 19.00
Northern coke foundry, No. 3	18.00 to 18.50
Southern coke, No. 1 f'dry and 1 soft	18.50 to 19.00
Southern coke, No. 2 f'dry and 2 soft	18.00 to 18.50
Malleable Bessemer	19.00
Basic	19.00
Low phosphorus	34.00
Silvery, 8 per cent	29.50
Bessemer ferrosilicon, 10 per cent	32.50

Rails and Track Supplies.—There is comparatively little railroad activity. A few inquiries have appeared for rails, among which were 5000 tons from the Pennsylvania Lines and 3000 tons from the Chicago & Alton. There is a floating inquiry for spikes and bolts, with some uncompleted negotiations for tie-plates. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, $50, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago, $33, base; open-hearth, $35; light rails, 25 to 45 lb., $40; 16 to 20 lb., $41; 12 lb., $42; 8 lb., $43; angle bars, 2c., Chicago.

Structural Material.—Liberal buying by the larger fabricating shops, one interest alone taking 10,000 tons, featured the week. In addition to the several large purchases, there was booked a sprinkling of smaller orders. For the most part the business was taken by the mills on the basis of 2.50c., Pittsburgh, rather than 2.60c. Contracts were booked, nominally for first half delivery, but with the understanding that mill convenience would govern. Contracts for the fabrication of steel included one of 400 tons for a skating rink at Chicago, taken by A. Bolter's Sons; one of 375 tons for the Stewart-Warner plant extension at Beloit, taken by the Federal Bridge Company, and another of like amount for the Soo Line, awarded to the Minneapolis Steel & Machinery Company. The American Bridge Company took a small contract at Cleveland and another at Milwaukee. In addition to the inquiry of the Nickel Plate for 500 box cars, the New York Central is taking prices on 1000 gondolas, the Elgin, Joliet & Eastern on 300 hoppers, and the Great Northern on 125 all-steel passenger coaches. We quote for Chicago delivery of structural steel from mill 2.689c. to 2.789c.

We quote for Chicago delivery of structural steel out of jobbers' stock 3.10c.

Rivets and Bolts.—Makers of bolts and nuts are for the present more largely concerned in the effort to handle customers' specifications than with the making of new contracts. On new business the published discounts usually apply, but the majority of consumers are protected under much more favorable contracts. We quote as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 50-5; cut thread, 40-10-2½; larger sizes, 35-2½; machine bolts up to ⅜ x 4 in., rolled thread, with hot pressed square nuts, 50-10; cut thread, 50; large sizes, 40-5; gimlet-point coach screws, 50-5; hot pressed nuts, square, $2.70 off per 100 lb.; hexagon, $2.70 off. Structural riv-

ets, ¾ to 1¼ in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 4c.; boiler rivets, 4.10c.; machine bolts up to ⅞ x 4 in., 50-10; larger sizes, 40-10; carriage bolts up to ¾ x 6 in., 50-5; larger sizes, 40-5; hot pressed nuts, square, $3.25, and hexagon, $3.25 off per 100 lb.; lag screws, 55.

Plates.—Plates unquestionably present the feature situation in the market. The inquiry for shipbuilding steel coming in this market, particularly from the Orient, shows no signs of recession, and the amazing fact is that buyers are offering to make outright purchases of plates for delivery as far ahead as July, 1917. In the narrower widths, conditions are less extreme, but prompt delivery can be had at little less than 3.50c., Pittsburgh. We quote for Chicago delivery of plates from mill, at its convenience, 3.189c. For prompt shipment we quote 3.439c. to 3.689c. in widths up to 72 in., and for wide plates 4.189c.

We quote for Chicago delivery of plates from jobbers' stocks, 3.50c.

Sheets.—The abnormal relation of prices for black sheets to plate prices is one of the conspicuous incongruities of the situation. For standard quality one-pass sheets, sales of which are somewhat heavier, quotations are firmer, ranging from 2.90c. to 3c., Pittsburgh, but a local consumer advises that, on a recent inquiry, prices were had from 2.75c. to 3.10c. Blue annealed prices are steadier, with a minimum of 3c., Pittsburgh. There is little activity in galvanized sheets and quotations approximate 4.20c., Pittsburgh. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.189c. to 3.339c.; box annealed, No. 17 and lighter, 3.039c. to 3.189c.; No. 28 galvanized, 4.389c. to 4.439c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.25c.; No. 28 galvanized, 4.65c. to 4.75c.

Bars.—Buying for first half delivery by fabricators, the manufacturing trade and local jobbers ran sales of steel bars up into large figures, one interest alone selling about 25,000 tons, the prices ranging from 2.50c. to 2.60c., Pittsburgh. The buying of bar iron is also more active, although there has at no time been an accumulation of backlog such as has characterized the selling of steel. We quote mill shipment, Chicago, as follows: Bar iron, 2.35c.; soft steel bars, 2.789c.; hard steel bars, 2.50c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.10c.; bar iron, 3.10c.; reinforcing bars, 3.10c. base with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting net list.

Wire Products.—New inquiry from abroad for barb wire has been received in the last few days, but Western producers have generally declined to quote. Domestic demand for nails and barb wire is an increasing problem. We quote as follows per 100 lb.: Plain wire, Nos. 6 to 9, base, $2.839; wire nails, $2.789; painted barb wire, $2.939; galvanized barb wire, $3.639; polished staples, $2.939; galvanized staples, $3.639; all Chicago.

Cast-Iron Pipe.—The only new business of moment last week was the award of 1000 tons at Chicago to the United States Cast Iron Pipe & Foundry Company. Prices of pipe have been advanced $1 per ton, and we quote as follows, per net ton, Chicago: Water pipe, 4 in., $34.50; 6 in. and larger, $31.50, with $1 extra for Class A water pipe and gas pipe.

Old Material.—Market prices of steel and rolling-mill scrap continue to advance, though buying by consumers is still light. Quotations on cast scrap have also begun to move upward and stove plate is stronger. The general level of prices is now closely approaching that of the last buying movement of the early summer. Obviously dealers in scrap are of the opinion that too little is being bought to make the deterrent effect of higher prices of consequence. The apparent scarcity of scrap is, if anything, more pronounced. The railroads, the largest individual source of supply, are conserving their car supply and labor and are picking up very little old material. Railroad lists of the past week were of little importance as to tonnage. Dealers' yards also are manufacturing a much less than normal quantity, labor shortage being a factor. In addition there is a disposition to hold back scrap in the expectation of a higher market when fall consumer buying resumes. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	$19.25 to $19.75
Relaying rails	19.50 to 20.50
Old carwheels	11.75 to 12.25
Old steel rails, rerolling	17.00 to 17.25
Old steel rails, less than 3 ft	17.75 to 18.00
Heavy melting steel scrap	16.25 to 16.75
Frogs, switching and guards, cut apart	16.25 to 16.75
Shoveling steel	15.75 to 16.25
Steel axle turnings	8.75 to 9.25

Per Net Ton	
Iron angles and splice bars	$18.75 to $19.00
Iron arch bars and transoms	20.50 to 21.00
Steel angle bars	15.25 to 15.75
Iron car axles	26.50 to 27.00
Steel car axles	28.00 to 28.50
No. 1 railroad wrought	16.50 to 17.00
No. 2 railroad wrought	15.50 to 16.00
Cut forge	15.00 to 15.50
Pipes and flues	12.00 to 12.50
No. 1 busheling	14.00 to 14.50
No. 2 busheling	9.50 to 10.00
Steel knuckles and couplers	14.75 to 15.00
Steel springs	15.25 to 15.50
No. 1 boilers, cut to sheets and rings	10.25 to 10.75
Boiler punchings	14.00 to 14.50
Locomotive tires, smooth	21.50 to 22.00
Machine-shop turnings	5.50 to 6.00
Cast-borings	6.50 to 7.00
No. 1 cast scrap	12.25 to 12.75
Stove plate and light cast scrap	9.75 to 10.25
Grate bars	10.00 to 10.25
Brake shoes	9.75 to 10.25
Railroad malleable	11.50 to 12.00
Agricultural malleable	11.00 to 11.50

Philadelphia

PHILADELPHIA, PA., Sept. 19, 1916.

The overwhelming demand for plates shows no abatement; it gets worse. That the condition is widespread is shown by the efforts of Westerners to buy in this market, wanting both plates and shapes. It is estimated that inquiries for commercial ships in the past week totaled 100,000 tons of plates and shapes, entirely aside from the huge requirements of the Government. Plate quotations are stronger than ever. Bars are active, and for prompt deliveries Bessemer steel or shell-discard material must be depended on. One large mill has sold its shell-discard steel for a period of eight months. The demand for structural material is not so urgent as for other products, but the demand from jobbers and other directions is strong and the mills have all they can do. Pig iron shows a slight increment of strength, but in general the market is unchanged. Many small or fair sized inquiries are out for foundry iron. Low phosphorus is in heavy demand for next year's delivery and several round lots have been taken. The representatives of English makers of 80 per cent ferromanganese have lowered their quotation to $165, seaboard, to meet domestic competition. Heavy melting steel continues without interest, but some scrap specialties are in demand at stronger prices.

Pig Iron.—No large inquiries or sales are reported, but there has been a good run of small and medium sized transactions which made up an excellent total. Prices are a little firmer, with less inclination on the part of buyers to search for the absolute minimum, as finding the lowest price involves more or less trouble and does not command grades commonly regarded as standard. Considerable buying has been at prices ranging from $20 to $20.25 for No. 2 X, Philadelphia, and occasionally higher. The deliveries specified are mostly for first quarter or first half. With regard to present consumption, a good sign is seen in the insistent demand that deliveries be not delayed. A Lansdale pipe plant has inquired for a round tonnage of pipe iron. No further interest in basic has developed. For standard low phosphorus there is a steady and heavy demand for both domestic and export shipment. Quotations are exceedingly strong, and some makers contemplate advancing their prices. Domestic consumers are eager to buy for next year, and several lots of 5000 tons and upward have been closed. Low phosphorus has been bought for export to England, France and Canada on the basis of $34 to $35, Philadelphia.

Lebanon low phosphorus has been fairly active at $30 to $32, furnace. The situation in Virginia iron is unchanged at $17.50 to $18.50, furnace, or $20.25 to $21.25, Philadelphia, for No. 2 X. One maker booked orders for 3500 tons in the week. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry	$19.50 to $20.00
Eastern Pa. No. 2 plain	19.25 to 19.75
Virginia No. 2 X foundry	20.25 to 21.25
Virginia No. 2 plain	20.00 to 20.75
Gray forge	18.50 to 19.00
Basic	19.75 to 20.00
Standard low phosphorus	34.00 to 35.00

Iron Ore.—In the week ended Sept. 16 the only arrival of foreign ore consisted of 7700 tons from Cuba.

Ferroalloys.—Representatives of English makers of 80 per cent ferromanganese have been authorized to quote $164 to $165, seaboard, first half delivery, thereby meeting the price recently quoted by domestic makers. Inquiry for at least 3000 tons is before the trade, one large steel company having asked for a price on 2000 tons, according to report. Representatives of a steel company named in this connection say it is not in the market. Blast-furnace ferrosilicon has been in excellent demand, and at least 1000 tons has been taken in the past few days. The quotation for 11 per cent material is unchanged at $34.44, Philadelphia. The arrival of 180 tons of English ferromanganese at this port last week is reported.

Plates.—In the past week inquiry for plates and shapes required in the construction of commercial ships aggregated about 100,000 tons, plates representing about 80 per cent of the total. Government bids to be opened to-day cover about 10,000 tons for two vessels, one to be constructed at Philadelphia and one at Boston—a hospital ship and a fuel carrier. The private yards in which are to be built the fighting units continue to ask the plate and shape makers for information on which to base their bids. Early naval construction will require 150,000 to 200,000 tons. One large mill when approached with an inquiry as to what it could be expected to supply replied that it did not care to give any assurances whatever. It quotes 4.159c. as its minimum, delivery at the mill's convenience, but has turned down offers made in excess of this price. Demand for first and second quarter delivery is heavy. A buyer wanting 1000 tons in the first quarter was offered that quantity in July or later at 4.15c., Pittsburgh, and was quoted 4.50c., Pittsburgh, for first quarter. The plates were wanted for shipment to Canada. An attractive tonnage of flange and fire-box plates, comparatively nearby delivery, was recently taken by an eastern Pennsylvania mill, on the basis of 4.50c., Pittsburgh, for tank plates. Westerners are asking for plates in this territory, but getting little satisfaction. In directions where the output and sizes are limited, probably 3.659c., Philadelphia, could be done, delivery in about eight weeks.

Bars.—While 2.60c., Pittsburgh, is the nominal price of open-hearth steel bars, up to 3.159c. is being obtained for Bessemer bars and for bars rolled from discarded shell steel. Prompt deliveries of the latter can be made. The demand is active. Iron bars are moving steadily at 2.659c., Philadelphia.

Structural Material.—Jobbers are taking material eagerly, and in many cases have it disposed of before the cars are unloaded. The scarcity of large building projects makes delivery of heavy shapes somewhat easier than lighter sizes, but all are difficult to get. No action has been taken on the projected plants of the Philadelphia Electric Company at Chester, requiring upward of 10,000 tons, and of the Westinghouse Machine Company at Essington, near Chester, about 5000 tons. The minimum quotation is 2.759c., Philadelphia, for open-hearth material, although up to 3.009c., Philadelphia, is asked for Bessemer steel. Western consumers have offered 2.75c., Philadelphia, equal to 2.901c., Pittsburgh.

Billets.—Open-hearth rerolling billets are unchanged at $48, Eastern mill, and forging steel at $65. One large steel company has sold its production of discard shell steel for the next eight months.

Sheets.—No. 10 blue annealed sheets are quoted at 3.159c. to 3.659c., Philadelphia.

Coke.—The coke producers continue hampered by a scarcity of men, which, together with their sold-up condition, makes coke not easy to get. Spot furnace is quoted at $2.75 to $2.85 per net ton at oven, and contract at $2.50. Spot foundry is quoted at $3.25 to $3.50 per net ton at oven, and contract at $3.15 to $3.40. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Old Material.—No interest is shown in heavy melting steel, the market being largely one of specialties. Wrought pipe, rerolling rails and railroad wrought are stronger. Among sales of old material made here last week by the Panama Railroad, about 1000 tons of carwheels brought $12.95 per net ton and 66 tons of old axles $36 per net ton, f.o.b. cars. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$14.75 to $15.25
Old steel rails, rerolling	18.00 to 18.50
Low phos. heavy melting steel scrap	21.25 to 23.50
Old steel axles (for export)	34.00 to 35.00
Old iron axles (for export)	34.00 to 35.00
Old iron rails	20.00 to 20.50
Old carwheels	15.50 to 16.00
No. 1 railroad wrought	21.00 to 22.00
Wrought-iron pipe	14.50 to 15.00
No. 1 forge fire	12.00 to 12.50
Bundled sheets	12.00 to 12.50
No. 2 busheling	10.50 to 11.00
Machine-shop turnings	7.50 to 8.00
Cast borings	9.00 to 9.50
No. 1 cast	16.00 to 16.50
Grate bars, railroad	11.75 to 12.25
Stove plate	11.75 to 12.25
Railroad malleable	13.50 to 14.00

St. Louis

ST. LOUIS, MO., Sept. 18, 1916.

Pig Iron.—Demand was active among the relatively smaller consumers and probably an aggregate of 15,000 tons was sold, while some 5000 tons is awaiting decision. Consumers are beginning to believe that there is little likelihood of lower prices within the period of need, and are endeavoring to cover themselves for the remainder of this year and the first half of next. Included in the sales were one of 1200 tons and one of 2000 tons, No. 2 and No. 3 Southern; 600 tons of No. 2 and 400 tons of No. 3. To a large extent the purchasers have been the stove foundries.

Coke.—Small lots have been sold at prices a little out of line with the regular quotations. By-product is quoted firmly on a parity with Connellsville and Virginia prices.

Finished Iron and Steel.—The steady absorption of finished products goes on. Demand is better for structural material, but warehouses are inclined to take care of their regular customers before considering the needs of others. Some movement in light rails for coal interests and track fastenings is noted. Warehouse business is active, with some prices marked up. For stock out of warehouse we quote as follows: Soft steel bars, 3.15c.; iron bars, 3.05c.; structural material, 3.15c.; tank plates, 3.80c.; No. 10 blue annealed sheets, 3.45c.; No. 28 black sheets, cold rolled, one pass, 3.40c.; No. 28 galvanized sheets, black sheet gage, 4.80c.

Old Material.—The scrap market is sharply stronger. Steel mills, foundries and rolling mills seem disposed to enter the market even at present high prices, while dealers are still inclined to speculate and also are buying to cover their short interests. The situation is one in which the prices are based chiefly on the last-named factors, aided by the encouragement given as a result of consumer interest in the market. The railroads are not offering much additional material, and this is also helping to hold prices up. The only lists out during the week included one of 350 tons from the Chicago, St. Paul, Minneapolis & Omaha and one of 200 tons from a local industry. Dealers are unable to find relaying rails, either light or standard section, though the former are not so strongly held as the

latter. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

	Per Gross Ton	
Old iron rails	$17.25 to	$17.50
Old steel rails, rerolling	16.50 to	17.00
Old steel rails, less than 3 ft	16.50 to	17.00
Relaying rails, standard section, subject to inspection	23.00 to	24.00
Old carwheels	12.50 to	13.00
No. 1 railroad heavy melting steel scrap	15.75 to	16.25
Heavy shoveling steel	14.50 to	15.00
Frogs, switches and guards cut apart	15.50 to	16.00
Bundled sheet scrap	8.00 to	8.50

	Per Net Ton	
Iron angle bars	$16.50 to	$17.00
Steel angle bars	14.50 to	15.00
Iron car axles	27.00 to	27.50
Steel car axles	28.00 to	28.50
Wrought arch bars and transoms	21.50 to	22.00
No. 1 railroad wrought	16.50 to	17.00
No. 2 railroad wrought	15.75 to	16.25
Railroad springs	15.50 to	16.00
Steel couplers and knuckles	15.00 to	15.50
Locomotive tires, 42 in. and over, smooth inside	21.00 to	21.50
No. 1 dealers' forge	12.50 to	13.00
Cast-iron borings	7.00 to	7.50
No. 1 busheling	14.00 to	14.50
No. 1 boilers, cut to sheets and rings	10.25 to	10.50
No. 1 railroad cast scrap	12.50 to	13.00
Stove plate and light cast scrap	9.25 to	9.50
Railroad malleable	11.00 to	11.50
Agricultural malleable	10.00 to	10.50
Pipes and flues	11.00 to	11.50
Heavy railroad sheet and tank scrap	11.00 to	11.25
Railroad grate bars	9.50 to	10.00
Machine shop turnings	7.00 to	7.50

Cincinnati

CINCINNATI, OHIO, Sept. 20, 1916.—(*By Wire.*)

Pig Iron.—The minimum price of Northern foundry, malleable and basic was advanced Tuesday to $18.50, Ironton, for shipment in the remainder of the year or through the first half. More foundry iron business was booked at the previous quotation of $18 than was made known, and the furnaces in the Ironton district are now in a comfortable position to maintain the advance. The price situation in the South is not quite so strong. Resale iron there is competing with furnace iron around $14, Birmingham, and it is also reported that some furnace iron can be obtained on firm offers for movement this year at the same figure. The majority of sales made lately have been on a basis of $14.50 for No. 2 foundry, while some special irons have brought $15. First half quotations range from $14.50 to $15. Quite a number of nearby small orders have been booked in the past few days, but large sales in this territory are scarce. A southern Ohio melter bought approximately 400 tons each of Northern and Southern foundry iron and two 600-ton lots of Southern iron were taken by a northern Ohio consumer. A Michigan manufacturer ordered 500 tons of Lake Superior charcoal and a local agency sold 2500 tons of Southern foundry to two central Illinois melters, with shipments extended to July 1. The general inquiry is light, and most of the business coming in is secured through the individual efforts of traveling salesmen. A Louisville firm is asking for 500 tons of Southern foundry iron, but confirmation cannot be obtained of the report that a basic user in this vicinity contemplates making further purchases at an early date. Malleable is slow, no sales having been reported lately. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	$17.90 to	$18.40
Southern coke, No. 2 f'dry and 2 soft	17.40 to	17.90
Southern coke, No. 3 foundry	16.90 to	17.40
Southern coke, No. 4 foundry	16.40 to	16.90
Southern gray forge	15.90 to	16.40
Ohio silvery, 8 per cent silicon	28.26 to	28.76
Southern Ohio coke, No. 1	20.76 to	21.26
Southern Ohio coke, No. 2	19.76 to	20.26
Southern Ohio coke, No. 3	19.26 to	19.76
Southern Ohio malleable Bessemer	19.76 to	20.26
Basic, Northern	19.76 to	20.26
Lake Superior charcoal	21.20 to	22.20
Standard Southern carwheel	24.90 to	25.40

(By Mail)

Finished Material.—Jobbers state that their particular concern now is to get shipments from the mills fast enough to take care of customers' requirements. The demand for structural material of all kinds is good, and as a consequence prices vary to a considerable extent, depending upon the supply. Plates ¼ in. and up are quoted from warehouse at 3.75c., base, Cincinnati; steel bars, strong at 3.20c.; twisted steel bars, 3.35c.; wire nails, $2.85 per keg, base; barb wire, $3.70 per 100 lb. Both black and galvanized sheets are in excellent demand and the nearby mills are paying particular attention to filling orders for their regular customers. We quote No. 28 galvanized sheets at 4.65c., Cincinnati or Newport, Ky., and No. 28 black at 3.15c. to 3.25c. The mill price on No. 10 blue annealed is also now 3.15c. to 3.25c. There is considerable difficulty in obtaining prompt shipment on hoops and bands. We quote hoops at 3c., Pittsburgh, and bands at 2.60c.

Coke.—Furnace coke is stronger than it has been for some time, but no additional contracts have come to light. Connellsville furnace coke is quoted all the way from $2.70 to $2.85 per net ton at oven for shipment this year and from $2.50 to $2.85 for yearly contracts. Wise County producers are asking 10c. to 15c. per ton above these figures. Foundry coke is obtainable around $3.50 at oven in all three fields for either prompt or future shipment. Only a small amount of spot shipment business is being transacted. The inquiry is very light, but a particularly good feature of the foundry coke situation is that the consumption is somewhat better than at this time last month.

Old Material.—Prices continue to advance, and with the exception of borings and turnings practically all grades have moved up 50c. per ton. Old iron axles were marked up last week $1.50 per ton, making the price higher than it has been for a long time. Heavy melting steel scrap is in better demand, and there is also a heavy call for No. 1 machinery cast. The following are dealers' prices f.o.b. at yards, southern Ohio and Cincinnati:

	Per Gross Ton	
Bundled sheet scrap	$11.25 to	$11.75
Old iron rails	16.25 to	16.75
Relaying rails, 50 lb. and up	21.50 to	22.00
Rerolling steel rails	15.25 to	15.75
Heavy melting steel scrap	14.75 to	15.25
Steel rails for melting	13.75 to	14.25

	Per Net Ton	
No. 1 railroad wrought	$14.50 to	$15.00
Cast borings	4.50 to	5.00
Steel turnings	4.75 to	5.25
Railroad cast	11.75 to	12.25
No. 1 machinery cast	13.50 to	14.00
Burnt scrap	8.75 to	9.25
Iron axles	26.50 to	27.50
Locomotive tires (smooth inside)	21.50 to	22.00
Pipes and flues	9.75 to	10.25
Malleable and steel	11.50 to	12.00
Railroad tank and sheet	9.00 to	9.50

Cleveland

CLEVELAND, OHIO, Sept. 19, 1916.

Iron Ore.—We note the sale of 10,000 tons of ore for this season's delivery and several other inquiries for small lots are pending. Most of the shippers have about all they can do to get down the ore already sold, but if they find they can handle a little more later they will take on a few small lots. Some additional reservations for next season are reported. The movement continues very heavy and if the record so far this month is kept up, September shipments may equal or exceed those of August. We quote prices as follows, delivered lower Lake ports: Old range Bessemer, $4.45; Mesaba Bessemer, $4.20; old range non-Bessemer, $3.75; Mesaba non-Bessemer, $3.55.

Pig Iron.—The market continues quite active in all grades and prices are firmer. Some of the furnaces are so well sold up for the first half of next year that they are rather indifferent about taking on additional orders at the present time. A Cleveland interest has advanced its Valley price on foundry iron to $19 for No. 2 and has made some sales at the advance. However, $18.50 foundry iron can still be had in the Valley. Foundry iron is quoted at $18.50, Toledo, and the market is not as firm there as at other northern Ohio points. The Erie price has been advanced to $19. A Canton consumer has taken 10,000 tons of basic iron for early delivery. Three sales aggregating about 15,000 tons of basic are reported at $18.50 for the first quarter delivery, and the market seems well established at that

price. Bessemer is still quoted at $21, Valley furnace. A Cleveland producer which has recently taken considerable Bessemer iron for export advanced its quotation to $22 on an inquiry for about 10,000 tons late in the week. A good volume of orders for foundry iron is coming out in this territory. A Cleveland automobile foundry has taken 4000 tons from a local furnace for first half delivery and a number of other sales are reported in lots up to 1000 tons. Southern iron is fairly active. A number of sales are reported for first half in lots up to 500 tons at $14.50, Birmingham, and one 650-ton lot at $15. A small amount of $14 Southern iron is still to be had for this year's delivery. We quote, delivered Cleveland, as follows:

Bessemer	$21.95
Basic	18.95
Northern No. 2 foundry	18.80
Southern No. 2 foundry	$18.50 to 19.00
Gray forge	18.50
Jackson Co., silvery, 8 per cent silicon	28.62
Standard low phos., Valley furnace	33.00

Coke.—There is some inquiry for furnace coke for prompt shipment, and consumers are having a great deal of trouble in picking up small lots because of the continued scarcity. There is practically no new demand for foundry grades. Standard Connellsville foundry coke is held at $3.25 to $3.50 per net ton at oven for prompt shipment and contract. We quote standard Connellsville foundry coke at $2.90 to $3 for prompt shipment.

Bolts, Nuts and Rivets.—The volume of bolt and nut specifications is not as heavy as a few weeks ago and makers are catching up somewhat on deliveries in some lines. The new demand is not quite as active as it has been. The production of rivet plants is being curtailed by the inability to secure shipments of steel. We quote rivets at 4c., Pittsburgh, for structural rivets and 4.10c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts, ⅜ x 16 in., smaller or shorter, rolled thread, 50 and 5; cut thread, 40, 10 and 2½; larger or longer, 35 and 2½; machine bolts within h. p. nuts, ⅜ x 4 in., smaller and shorter, rolled thread, 50 and 10; cut thread, 50; larger and longer, 40 and 10; lag bolts, gimlet or cone point, 50 and 5; square h. p. nuts, blank or tapped, $2.70 off the list; hexagon h. p. nuts, blank or tapped, $2.70 off; c. p. c. and t. sq. nuts, blank or tapped, $2.40; hexagon nuts, all sizes, $2.80 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 5.

Finished Iron and Steel.—The delivery situation is more serious than at any previous time during the past few months. Some manufacturers have been forced to cut down production because of the lack of sufficient steel, and with mills unable to improve their deliveries this situation threatens to become worse. The scarcity of semi-finished steel continues. Several Ohio mills are in the market for additional tonnage of sheet bars for the last quarter. The Empire Rolling Mill Company, which was recently inquiring for sheet bars, has decided because of the condition of the market to further postpone the starting up of its new Cleveland sheet mill. A number of railroads have come into the market with tentative inquiries for rails for 1917 delivery, and there is a definite inquiry from the Ann Arbor road for 2500 tons. An industrial company has an inquiry out for 800 tons of standard rails for early delivery on which it has been quoted $50, Pittsburgh. The only new structural contract placed is for 500 tons for an addition to the plant of the Mansfield Sheet & Tin Plate Company, which was taken by the Massillon Bridge & Structural Company, Massillon, Ohio. The warehouse situation has become quite serious owing to the depletion of stocks and the inability to secure shipment from mills. This is particularly true of structural material. There is a possibility of an advance in some warehouse prices, particularly plates. The demand for plates continues very heavy and a local mill is now quoting a minimum of 4.25c., Pittsburgh, for early delivery. The volume of export plate business is heavy. Prices on steel bars and structural material for early shipment are firmer, a mill that is able to make fairly prompt deliveries now quoting bars at 2.75c. to 3c., Pittsburgh, and shapes at 2.85c. to 3c. The demand for black and galvanized sheets is more active. Black sheets are firm, and are generally quoted at 3c. to 3.15c. and higher, Ohio mill, for No. 28. We quote blue annealed sheets at 2.90c. to 3.10c. for No. 10, and galvanized at 4.15c. to 4.30c. for No. 28. Bar iron is quoted at 2.40c. to 2.50c., Cleveland. Warehouse prices are 3.25c. for structural material; 3.65c. for plates and 3.25c. for iron bars.

Old Material.—There is a decidedly better feeling in the scrap market and higher prices are being asked for several grades. Most of the activity is between dealers who are covering on old contracts on which they are short. However, some of the mills which have not been buying scrap for some time are now coming into the market. Not much scrap is being offered at the present time owing to the fact that producers are holding for higher prices and brokers are having difficulty in securing material to cover on contracts, and they are not eager to take on additional orders at the present time. They are offering $16.75 to $17 for heavy melting steel for round lots for Youngstown and Canton delivery but will pay only $16.50 for small tonnages. The demand for borings has improved. Some local demand has sprung up for busheling, which has been inactive for a number of weeks and sales have been made up to $13, or nearly $2 a ton higher than recent quotations. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Steel rails	$15.25 to $15.75
Iron rails	18.50 to 19.00
Steel car axles	32.00 to 33.00
Heavy melting steel	15.75 to 16.25
Carwheels	12.75 to 13.00
Relaying rails, 50 lb. and over	25.00
Agricultural malleable	12.50 to 12.75
Railroad malleable	14.00 to 14.25
Steel axle turnings	12.00 to 12.50
Light bundled sheet scrap	12.00 to 12.25

Per Net Ton

Iron car axles	$24.00 to $25.00
Cast borings	6.00 to 6.25
Iron and steel turnings and drillings	5.50 to 5.75
No. 1 busheling	12.75 to 13.00
No. 1 railroad wrought	15.50 to 16.00
No. 1 cast	13.00 to 13.50
Railroad grate bars	10.00 to 10.50
Stove plate	10.00 to 10.25

Birmingham

BIRMINGHAM, ALA., Sept. 18, 1916.

Pig Iron.—Making or selling pig iron is not the puzzle in the Southern field now; moving it is the problem. Lack of cars as well as dearth of ship-room has had much to do with postponement of a number of export shipments. Meanwhile, all operators agree that the market remains on a basis of $14.50 for spot and rest of year, with $15 asked, and sometimes obtained, for 1917. It is evident to some operators, who failed to make bookings at $14.50, that as low as $14 was done on a lot of new business early in the month. They, in turn, unite in making the statement that around the 15th of the month they heard no more of $14 metal, nor of anything done under $14.50. The leading interest is reported as having participated in very recent business at $14.50 and even $15, which ought to indicate the market, because it has not been an active solicitor. It develops that bookings of basic iron have been very large. Orders independent of the leading interest have perhaps been around 100,000 tons. The Anniston stack, recently blown in, is well booked for several months ahead on sales made at a minimum of $14 and a maximum of $15. A very large interest reports the sale of its make so far this month as well as for last month. Another interest made a variety of bookings at $14.50 and $15 for spot and the rest of the year. The market is quite firm. Export inquiry is active. The Tennessee Company is making ferromanganese at one of its Bessemer stacks. The large machine shops are taking quantities of iron and the foundry outlook is most promising. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$15.00 to $15.50
No. 2 foundry and soft	14.50 to 15.00
No. 3 foundry	14.00 to 14.50
No. 4 foundry	13.75 to 14.25
Gray forge	13.50 to 14.00
Basic	14.50 to 15.00
Charcoal	22.00 to 22.50

Coal and Coke.—There is only one cry of distress in the Southern coal field and that is the car shortage.

A leading steam coal operator places the betterment in demand at 40 per cent, others much lower, but all agree on a general improvement. Domestic mines have raised prices for fall and winter delivery. All coal that can be delivered is more or less at a premium. Coke suffers from the car shortage. The demand is as stiff as it has been for several months. Some furnace coke sold during the week at $3.75 per net ton at oven. Standard beehive foundry makes bring $4.25 and $4.50.

Cast-Iron Pipe.—The water and gas pipe factories are busy on a batch of small orders, but report a dearth of large business. The outgoing movement is quite heavy, and yards have now very little stock. Operations remain on the same basis as for months. Pipe for the oil fields is moving in quantities from the North Birmingham plant of the leading interest. The sanitary shops are running 60 per cent of capacity. We quote, per net ton, f.o.b. pipe shop yards, as follows, 4-in., $28; 6-in. and upward, $25, with $1 added for gas pipe.

Old Material.—Dealers are somewhat at a loss to account for the comparatively small demand, attributing it partly to the disappearance of the trade with Pennsylvania, incident to advanced freight rates. Wrought scrap is reported active, but other classes, although moving a trifle more liberally, are not going in quantities desired. Enormous accumulations of scrap at shrapnel mills is partly the cause of the backward conditions. Prices, however, are somewhat stiffer. We quote, per gross ton, f.o.b. Birmingham, dealers' yards, as follows:

Old steel axles	$25.00 to $30.00
Old steel rails	11.50 to 12.00
No. 1 steel	10.50 to 11.00
No. 1 wrought	12.50 to 13.00
No. 1 cast	10.50 to 11.00
Extra heavy cast	10.00 to 10.50
Stove plate and light	8.50 to 9.00
Carwheels	11.00 to 11.50
Tram carwheels	10.50 to 11.00

San Francisco

SAN FRANCISCO, CAL., Sept. 12, 1916.

The restoration, for the present at least, of stable traffic conditions has brought a much better feeling on this coast, and a seasonable resumption of activity in the jobbing movement of finished products has been noted since Sept. 1, notwithstanding the interruption of two holidays. Local building shows much improvement, and there is considerable special buying for municipal and large corporation requirements, as well as for marine work. On the other hand, specifications and mill bookings in several lines have fallen off, owing to the accumulation of stocks last month. Oriental inquiries are again on the increase. The Eastern steel mills generally have made a change in the terms of their contracts with Pacific coast buyers, stopping the former privilege of cancellation at will and requiring that the full tonnage contracted for be taken. This works a hardship on many manufacturers of this district, whose business is of such a nature that their requirements cannot be gaged accurately in advance. The change is regarded favorably by some of the merchants, however, on the ground that it discourages undesirable speculation by persons not regularly in the trade. As far as can be learned, no contracts have yet been made here for delivery next year.

Bars.—The recent improvement in building is stimulating the movement of reinforcing bars, concrete construction being used throughout in many manufacturing buildings now under way. Stocks of merchant bars are fairly large and jobbers are buying little from the mills, though the distributive trade is active. Specifications for both steel and iron bars are coming out well from the larger consumers, whose requirements are in many cases above normal. Foreign business is assuming more importance, though local mills are disposed to take care of their regular trade before booking further export orders. The jobbing prices remain at 4c. for steel and 3.90c. for iron bars.

Structural Material.—Bridge inquiries continue fairly numerous, with more in sight. Contracts for fabricated material for large buildings are appearing but slowly, though there is a good deal of tentative figuring. Most of the shops are now in fair shape, having considerable small work on hand. Contracts have been let for a lot of small bridges near Baker City, Ore.; the Northwest Steel Company, Portland, has the fabricating contract for a new post office in that city; a contract has been let for a steel bridge at Klamath Falls, Ore., and Navajo County, Ariz., has let a number of bridge contracts to Mesmer & Rice and the Omaha Structural Steel Works. Bids will be taken Sept. 28 for a 108-ft. steel bridge in San Bernardino County, Cal. Plans have been submitted for a new $500,000 library for Stanford University. Frederick & Nelson, Seattle, Wash., are preparing to build a large department store. Plans are under way for a large steel-frame church on Filbert Street, this city.

Plates.—Shipbuilding requirements keep wide plates fairly well cleaned up, and new inquiries in this line are continually appearing. The small jobbing trade has revived in good shape. Riveted pipe business continues an important item, Los Angeles having just received new bids for pipe requiring nearly 8000 tons of plates and sheets. The local jobbing price remains at 4.75c.

Sheets.—Corrugated sheets still find very little demand, but flat galvanized sheets are moving much better in a distributive way, and black sheets also receive some attention. Blue annealed sheets continue in good demand for large pipe work and manufacturing requirements, with some improvement in the small trade. There is also a steadily increasing foreign demand.

Tin Plate.—The larger Pacific coast canning interests are beginning to make provision for the coming year's requirements, which in the case of Puget Sound salmon interests will be much heavier than this year. The placing of the business may be affected somewhat by the recent consolidation of several important canning interests. Some urgent inquiries are also appearing from Oriental packers, who want delivery before Jan. 1, but seem to have some difficulty in placing their orders.

Wrought Pipe.—The advance announced Sept. 7 has had little effect on local conditions. Oil-field business is in good shape, and the jobbing trade has improved slightly, but with rather heavy stocks in the hands of most merchants there is little new buying. A few good-sized municipal contracts have been placed.

Cast-Iron Pipe.—The postponement of the freight advance has, of course, suspended the high prices recently announced for Pacific coast points. Business is quiet, either from municipalities or corporations. Small inquiries are expected shortly for waterworks at Vallejo, Cal., and the local Presidio, and new bids are to be taken on a 4-in. line for the naval training station, Yerba Buena Island.

Pig Iron.—The recent heavy movement in anticipation of the expected freight advance has been followed by a practical cessation of new business, as there is an exceptionally heavy tonnage in melters' hands. Little revival is expected before November, though the foundries continue busy. Local agents quote No. 1 Southern foundry iron at $26.50 to $27 per gross ton.

Coke.—Most consumers have ordered out all the coke under contract, and now have enough to last practically for the rest of the year. There is accordingly little new business, and quotations are nominal.

Old Material.—Cast-iron scrap is moving to the foundries at about the same rate as for the past year, the demand being fairly active. Supplies are ample, however, and prices on ordinary offerings are around $16 per net ton, with some sales made above that figure. The principal consumers have their steel scrap requirements pretty well covered and are buying little. Such sales as are made are usually within the former range of $10 to $12 per gross ton.

Ferroalloys.—Both ferromanganese and ferrosilicon are moving out of stock in small quantities, with ade-

quate offerings for all present needs. The Noble Electric Steel Company is producing a limited quantity of silicomanganese and has just shipped an experimental carload to Liverpool, as there is no local market for this material at present.

New York

NEW YORK, Sept. 20, 1916.

Pig Iron.—Transactions have not been as large as in the preceding week, but there are indications that a number of the smaller foundries are looking about for their iron for the first half of 1917. This is true to some extent in New England, where the average foundry of small or moderate size has been carrying a good deal of pig iron in yard. One of the largest sales of the week was 5000 tons of malleable to a western New York railroad equipment company, deliveries being largely for this year. At Poughkeepsie a purchase of 2500 tons by a plow company is reported, though this was made nearly a fortnight ago. In New Jersey a foundry making furnace castings closed for 1500 tons for the first half, the business going to three or four furnaces. Another New Jersey sale was of 1200 tons, also for 1917. Virginia iron has not figured in transactions in this district, but the prices of Virginia furnaces range from $17.50 to $18.50 for No. 2 X at furnace. Foreign inquiry keeps up. England is still in the market for steel-making iron and there is some demand for foundry iron for western Europe. Vessel room is hard to get, apart from any question of rates. South America has bought some foundry iron in the past week. Some furnaces are rather firmer in their views and two Buffalo interests are now asking close to $19 for No. 2 X for forward delivery. We quote at tidewater for early delivery: No. 1 foundry, $20 to $20.50; No. 2 X, $19.50 to $20; No. 2 plain, $19.25 to $19.50; Southern iron at tidewater, $19.75 to $20.25 for No. 1 and $19.50 to $19.75 for No. 2 foundry and No. 2 soft.

Ferroalloys.—British producers of 80 per cent ferromanganese have reduced their quotation $10 per ton to $165, seaboard, but few sales by them are reported at the new price. The change has largely been caused, it is understood, by the fact that American producers have recently been offering and selling several thousand tons at $165, delivered. It is reported that domestic makers have now stiffened their quotations to $165, furnace. There are still inquiries in the market from both domestic and foreign consumers, but they are not large. About 200 tons was sold for foreign use. Spiegeleisen is quoted at $45, furnace, with little demand, though some domestic material is on the market. Ferrosilicon, 50 per cent, is strong. On a recent large foreign inquiry of 1000 tons, $98, New York, was bid. Spain and Italy are asking for ferrosilicon and other ferroalloys.

Finished Iron and Steel.—Signs point toward higher prices, at least such views are held by sellers. A continued inflow of inquiry helps to account for the attitude, though much of this proffered business is for far future delivery, as for ship-building purposes. All branches of the finished steel business do not show the same picture; indeed, in many lines 1917 buying is discouraged and in cases refused. Car buying by the railroads is looking upward and more tonnage jobs in structural steel are under consideration, but the steel trade does not find that the buyer has yet accustomed himself to think in terms of present price levels without comparison with the much lower ones of early 1915. The longer the wait the greater will be the volume of buying, it is held, when car purchases and building projects are no longer postponed. In foreign demand an inquiry for 35,000 tons of rails for France stands out, and tentative inquiries are noted for 10,000 to 20,000 cars for France and 12,000 cars for Italy. A sale of 2000 tons of 1½ and 2 in. angles for one of the European belligerents at 3.25c. at mill has been made. One mill has in the past week quoted on about 35,000 tons of ship plates for mid 1917 shipment, asking 4c., Pittsburgh. About 12,000 tons of structural steel work has been put under contract for sizeable jobs as enumerated below, and upward of 17,000 tons has come to light in the way of fresh undertakings. The largest single award involves about 6000 tons for the Paterno apartment superstructure, Grand Central terminal area, leaving the substructure, 3500 tons, still pending at this writing. The Passaic Structural Steel Company is to do this work and also 500 tons for the Campagna apartment, Ninety-fourth Street and West End Avenue. Large new work includes some 6000 tons for the Chester Waterside power station, Chester, Pa., for the Beacon Light Company and some 7500 tons for the New Haven's Thames River bridge, the latter an early expectation. It is understood that the mail and express building at the New York Central terminal area is shortly to have thirteen stories added, and the hotel in the same district is again being talked of. Bids go in on Sept. 28 for 1600 tons of subway work at the 239th Street yard and 1500 tons for the Racquet and Tennis Club is up for figures. The work closed includes also the following: 1100 tons to the Harris Silvers Baker Company for the Ferguson apartment, Amsterdam and Eighty-seventh Streets; 1000 tons, placed in the East, with the Wisconsin Bridge Company for the Federal Rubber Company, Cudahy, Wis.; 600 tons to A. E. Norton, Inc., for a Bing & Bing apartment, West Sixtieth Street; 800 tons to the Hinkle Iron Company for the Tishman apartment at Seventy-second Street and Lexington Avenue; 900 tons to Milliken Brothers, Inc., for a trade school for girls, and 600 tons to the New England Structural Company for the New England Telephone Company at Springfield, Mass. Two 250-ton jobs have also been closed; one for the Elmira Reformatory and the other for elevated railroad work at Eighth Avenue and 151st Street. We quote mill shipments of plain structural material at 2.769c. to 3.019c., New York, for delivery in two to three months. Steel bars are quoted at 2.769c. for delivery at convenience of the mill, and as high as 3.169c. for, say, three months, and limited largely to Bessemer steel; bar iron is quoted at 2.669c. and steel plates at 3.169c. to 4.169c., the wider the plates and the earlier the delivery the higher the price. Out of store shapes and iron and steel bars are quoted at 3.25c., New York; plates, 4c.

Old Material.—The demand is running largely to specialties. Iron rolling mills are fair buyers of wrought scrap, pipe and borings, while the only demand for steel scrap is from brokers who are resuming shipments to Pittsburgh. Heavy melting steel scrap for Pittsburgh shipment is bringing $13.25, New York. Blast furnaces are taking some mixed borings and turnings. Brokers quote buying prices for the Eastern trade about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications)	$11.75 to $12.00
Old steel rails (short lengths) or equivalent	12.50 to 12.75
Relaying rails	27.50 to 28.00
Relaying rails (for export)	30.00 to 32.00
Rerolling rails	17.00 to 17.25
Rerolling rails (for export)	19.00
Iron and steel car axles (for export)	35.00 to 37.00
No. 1 railroad wrought	19.00 to 19.25
Wrought-iron track scrap	15.50 to 16.00
No. 1 yard wrought, long	13.50 to 14.00
No. 1 yard wrought, short	11.75 to 12.00
Light iron (nominal)	3.50 to 4.00
Cast borings (clean)	6.75 to 7.00
Machine shop turnings (nominal)	4.50 to 4.75
Mixed borings and turnings (nominal)	4.50 to 4.75
Wrought pipe	12.00 to 12.50

Foundries are evidently somewhat better employed, as they are buying in larger volume. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery)	$15.75 to $16.00
No. 2 cast (heavy)	14.00 to 14.50
Stove plate	11.50 to 12.00
Locomotive grate bars	10.00 to 10.50
Old carwheels (nominal)	15.00
Malleable cast (railroad)	12.00 to 12.50

Cast-Iron Pipe.—No special feature has marked the business of the past week. Municipal lettings are conspicuous by their absence and private buying has not been especially heavy. The long looked for advance has

materialized, and carload lots of 6-in., class B and heavier, are now quoted at $31.50 per net ton, tidewater, class A, and gas pipe taking an extra of $1 per ton.

British Steel Market

Foundry Pig Iron Easier but Hematite Scarce—American Billets Slow

(By Cable.)

LONDON, ENGLAND, Sept. 20, 1916.

The position of Cleveland foundry pig iron is easier and the embargo has been removed on sales to Scotland. Forge iron is slow and makers are accumulating stocks. The hematite scarcity is intense. American billets are slow, with 4-in. quoted at $68 to $70 for January-March delivery c.i.f. Liverpool; but the stiff terms are discouraging business. Tin plates are dull and practically unchanged. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 33s. to 35s.
Steel black sheets, No. 28, export, f.o.b. Liverpool, £20 5s.
Steel ship plates, Scotch, delivered local yards, £13 17s. 6d.
Steel rails, export, f.o.b. works, £10 17s. 6d.
Hematite pig iron, f.o.b. Tees, about 140s.
Sheet bars (Welsh) delivered at works in Swansea Valley, £10 7s. 6d.
Steel bars, export, f.o.b. Clyde, £18.
Ferromanganese (nominal), £35.
Ferrosilicon, 50 per cent, c.i.f., £27.

Buffalo

BUFFALO, N. Y., Sept. 19, 1916.

Pig Iron—The market is very strong for all grades, but particularly for steel-making irons. Malleable also shows an increased demand. A considerable tonnage of the various grades has been sold during the week, taking into account the fact that most producing interests are well sold up and not soliciting business. Sales included 2000 tons of Bessemer at $22 at furnace and smaller quantities of forge iron at $19 at furnace. A large number of inquiries are still before the market and are likely to materialize into orders—as far as they can be accommodated by furnaces—before the end of the week. Some makers report that shipping instructions for iron under contract are in excess of their ability to meet the demands made. We quote as follows, f.o.b. furnace, Buffalo, for delivery to and including the first half of 1917:

No. 1 foundry	$19.00 to $20.00
No. 2 X foundry	19.00 to 19.50
No. 2 plain	19.00 to 19.25
No. 3 foundry	19.00
Gray forge	19.00
Malleable	19.25 to 19.50
Basic	19.00 to 20.00
Bessemer	22.00
Charcoal, regular brands and analysis	21.00 to 22.00

Old Material.—The demand continues strong in nearly every line. Heavy melting steel is still leading, with increased dealings in wrought and cast scrap. Steel axles for export continue in great demand. The price for iron axles has this week advanced to the same price as for steel axles. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$15.50 to $16.00
Low phosphorus steel	20.00 to 20.50
No. 1 railroad wrought scrap	17.50 to 18.00
No. 1 railroad and machinery cast scrap	15.50 to 16.00
Steel axles	32.00
Iron axles	32.00
Carwheels	13.00 to 13.50
Railroad malleable	15.50 to 16.00
Machine shop turnings	6.00 to 6.50
Heavy axle turnings	12.00
Clean cast borings	7.50 to 7.75
Iron rails	18.00 to 18.50
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	11.50 to 12.00
Wrought pipe	12.00 to 12.50
Bundled sheet scrap	11.50 to 12.00
No. 1 busheling	13.00 to 13.50
No. 2 busheling	11.00 to 11.50
Bundled tin scrap	15.00 to 15.50

Finished Iron and Steel.—Inquiry for finished material, both in the form of open orders and outright contracts, has increased. The general situation is stronger than it has been at any time so far. Mills are turning down business right along, not being in position to take forward contracts. If the books were opened a flood of orders could be secured. Considerable activity is being displayed in cold-rolled steel, which has had a tendency to advance. Plates are almost unobtainable at any price. There has been considerable activity in inquiry from Canadian users of wire rods. The Buffalo Structural Steel Company will supply the steel for a movable tower for the new Central Elevator on the Buffalo River, about 150 tons.

Iron and Industrial Stocks

NEW YORK, Sept. 20, 1916.

Not for a long time has the stock market been so active as for the most part of the past week. Prices rose sharply on many securities, Steel Corporation common and Republic common, as well as a few others, making new high records. Profit taking caused some recessions on Monday of this week. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	24¼ - 27⅝	Pressed Stl., pref.	100½-103
Allis-Chal., pref.	79¼ - 82	Ry. Steel Spring, com.	51¼ - 56½
Am. Can, com.	63 - 66⅞	Ry. Steel Spring, pref.	100¼-101⅝
Am. Can, pref.	112 -115	Republic, com.	65⅝ - 69¾
Am. Car & Fdy., com.	63 - 68¾	Republic, pref.	110½*-116½
Am. Car & Fdy., pref.	115¾-116½	Sloss, com.	57½ - 60⅞
Am. Loco., com.	78 - 82½	Sloss, pref.	97¼ - 98½
Am. Loco., pref.	104½-106⅞	Pipe, com.	22 - 24½
Am. Steel Fdries.	57 - 59¾	Pipe, pref.	54 - 55⅝
Bald. Loco., com.	81¾ - 93	U. S. Steel, com.	104 -109
Bald. Loco., pref.	106 -106½	U. S. Steel, pref.	119 -121⅛
Beth. Steel, com.	525 -580	Va. I. C. & Coke.	54 - 58¼
Case (J. I.), pref.	84	Westing. Elec.	62¼ - 65¼
Colorado Fuel	51½ - 56¾	Am. Rad., com.	399 -400
Deere & Co., pref.	90 - 92	Am. Ship, com.	49 - 49½
Gen. Electric	170 -175¼	Am. Ship, pref.	94
Gt. No. Ore Cert.	41¼ - 44¾	Chic. Pneu. Tool.	73 - 76½
Int. Harv. of N. J., com.	116 -118	Lake. Sup. Corp.	11½ - 14⅞
Int. Harv. of N. J., pref.	117⅞-119¾	Warwick	9¾
Int. Harv. Corp., com.	77⅞ - 78	Cruc. Steel, com.	83⅝ - 97½
Int. Harv. Corp., pref.	108 -109	Cruc. Steel, pref.	117 -120¾
Lacka. Steel	83¾ - 86¼	La Belle Iron, com.	59¼ - 62
Nat. En. & Stm., com.	27½ - 31⅛	Can. Car & Fdry., pref.	72 - 80
Nat. En. & Stm., pref.	95	Carbon Stl., com.	86 - 90
N. Y. Air Brake.	139¾-146	Central Foundry, com.	12 - 13½
Pitts. Steel, pref.	99 -101½	Central Foundry, pref.	23 - 29
Pressed Stl., com.	58 - 61	Driggs-Seabury	89 -119¾
		Midvale Steel	69½ - 74¼

*Ex-dividend.

Dividends

The directors of the Lackawanna Steel Company, at a meeting Sept. 13, being advised that the company had paid off all of the moneys borrowed in connection with the redemption on March 31 last of the company's two year 6 per cent notes, thus completing the payment during the past two years of $10,000,000 face value of funded indebtedness, and that the company was now free of floating indebtedness, and that the privilege of discounting payments for current supplies was being regularly availed of, felt, that in view of the large current earnings it was proper to begin distributions to the stockholders. They therefore declared out of surplus net earnings of the company a dividend of 6 per cent on the common stock, payable in four quarterly instalments on Sept. 30 and Dec. 30, 1916, and March 31 and June 30, 1917.

The Westinghouse Air Brake Company, regular quarterly, $2 per share, payable Oct. 21.

The Union Switch & Signal Company, regular quarterly, $1.50 per share each on the common and preferred stocks, payable Oct. 14.

The Brier Hill Steel Company, regular quarterly, 1¾ per cent on the preferred and 1½ per cent on the common stock.

The Gulf States Steel Company, initial quarterly, 2 per cent on the common stock, payable Jan. 2. This places the stock on an 8 per cent basis. The directors also declared an additional 3 per cent on the second preferred stock, half of which is payable Nov. 1 and half Feb. 1.

The American Brake Shoe & Foundry Company, regular quarterly, 1¾ per cent on the common and 2 per cent on the preferred stock, payable Sept. 30.

The Toledo Machine & Tool Company, extra of 5 per cent in addition to the regular monthly dividend of 2 per cent.

The Billings & Spencer Company, regular quarterly, 2 per cent, and extra 3 per cent, payable Oct. 2.

The Crucible Steel Company of America, 1¼ per cent on account of the accumulated dividends on the preferred stock, payable Oct. 1.

The Wheeling Steel & Iron Company, 3 per cent, payable Sept. 30.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast (by rail only), 65c.

Structural Material.—I-beams, 3 to 16 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees 3 in. and over, 2.60c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Plates.—Tank plates, ¼ in. thick, 6 in. up to 100 in. wide, 3c. to 4c., base, net cash, 30 days, or ½ of 1 per cent discount in 10 days, carload lots. Extras are:

Quality Extras

	Cents per lb.
Tank steel	Base
Pressing steel (not flange steel for boilers)	.10
Boiler and flange steel plates	.15
"A. B. M. A." and ordinary firebox steel plates	.20
Still bottom steel	.30
Locomotive firebox steel	.50

Marine steel, special extras and prices on application.

Gage Extras

	Cents per lb.
Rectangular, 1¼ in. thick, over 6 in. wide to 100 in. wide.	Base
Lighter than ¼ in., to 3/16 in., up to 72 in. wide	.10
*Lighter than ¼ in., including 3/16 in., over 72 in. to 84	.20
*Lighter than ¼ in., including 3/16 in., over 84 in. to 96	.30
*Lighter than ¼ in., including 3/16 in., over 96 in. to 100	.40
*Lighter than ¼ in., including 3/16 in., over 100 in. to 102	.45
Lighter than 3/16 in., including No. 8, up to 72 in. wide	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96	.35
Lighter than No. 8, including No. 10, up to 60 in. wide.	.30
Lighter than No. 8, including No. 10, over 60 in. to 64	.35

Up to 72 in. and not less than 10.2 lb. per sq. ft. will be considered ¼ in.
Over 72 in. must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.
Over 72 in., ordered weight, 3/16 in., take No. 8 price.
Over 72 in., ordered weight No. 8, take No. 10 price.

Width Extras

Over 100 in. to 110 in. inclusive	.05
Over 110 in. to 115 in. inclusive	.10
Over 115 in. to 120 in. inclusive	.15
Over 120 in. to 125 in. inclusive	.25
Over 125 in. to 130 in. inclusive	.50
Over 130 in.	1.00

Length Extras

Universal plates 80 ft. long up to 90 ft. long	.05
Universal plates 90 ft. long up to 100 ft. long	.10
Universal plates 100 ft. long up to 110 ft. long	.20

Cutting Extras

No charge for rectangular plates to lengths 3 ft. and over.

Lengths under 3 ft. to 2 ft. inclusive	.25
Lengths under 2 ft. to 1 ft. inclusive	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in.	.30
Circles over 100 to 110 in. (width extra)	.35
Circles over 110 to 115 in. (width extra)	.40
Circles over 115 to 120 in. (width extra)	.45
Circles over 120 to 125 in. (width extra)	.55
Circles over 125 to 130 in. (width extra)	.80
Circles over 130 in. (width extra)	1.30
Circles under 3 ft., to 2 ft., inclusive	.55
Circles under 2 ft. to 1 ft. inclusive	.80
Circles under 1 ft.	1.85

Half circles take circle extras.

Sketches, not over four straight cuts, inc. straight taper	.10
Sketches having more than four straight cuts	.20

Plates sheared to a radius take complete circle extras.

*Including extra for width.

Wire Rods.—Including chain rods, $55 to $60.

Wire Products.—Prices to jobbers effective Aug. 5: Fence wire, Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, $2.55; galvanized, $3.25. Galvanized barb wire and staples, $3.45; painted, $2.75. Wire nails, $2.60. Galvanized nails, 1 in. and longer, $2 advance over base price; shorter than 1 in., $2.50 advance over base price. Cement-coated nails, $2.50. Woven wire fencing, 60 per cent off list for carloads, 59 off for 1000-rod lots, 58 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	6 to 9	10	11	12&12½	13	14	15	16
Annealed	$2.60	$2.65	$2.70	$2.75	$2.85	$2.95	$3.05	$3.15
Galvanized	3.30	3.35	3.40	3.45	3.55	3.65	4.10	4.20

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect on black pipe from Sept. 7, 1916, and on galvanized pipe from July 24, 1916, all full weight:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	62	35½	⅛ and ¼	51	24
½	66	51½	⅜	52	25
¾ to 3	69	55½	½	56	38
			¾ to 1½	59	43

Lap Weld

2	63	50½	1¼	46	31
2½ to 6	66	53½	1½	52	38
7 to 12	63	49½	2	53	39
13 and 14	63½	..	2½ to 4	55	42
15	51	..	4½ to 6	55	42
			7 to 12	54	41

Reamed and Drifted

1 to 3, butt	67	53½	¾ to 1½, butt	54	37
2, lap	61	48½	1¼, lap	41	25
2½ to 6, lap	64	51½	1½, lap	47	32
			2, lap	48	33
			2½ to 4, lap	51	36

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	58	40½	⅛, ¼ and ⅜	51	34
½	63	50½	½	56	43
¾ to 1½	67	54½	¾ to 1½	60	45
2 to 3	68	55½			

Lap Weld, extra strong, plain ends

2	61	49½	1¼	48	33
2½ to 4	64	52½	1½	53	39
4½ to 6	63	51½	2	55	42
7 to 8	59	45½	2½ to 4	57	45
9 to 12	54	40½	4½ to 6	56	44
			7 to 8	50	38
			9 to 12	45	33

Butt Weld, double extra strong, plain ends

½	54	43½	½	43	31
¾ to 1½	57	46½	¾ to 1½	46	34
2 to 2½	59	48½			

Lap Weld, double extra strong, plain ends

2	53	43½	1½	42	30
2½ to 4	55	45½	2	42	30
4½ to 6	54	44½	2½ to 4	44	35
7 to 8	49	35½	4½ to 6	43	34

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, freight to destination added, effective from Sept. 7, 1916, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1½ in.	33	1½ in.	25
1¾ and 2 in.	45	1¾ and 2 in.	37
2¼ in.	42	2¼ in.	34
2½ and 2¾ in.	48	2½ and 2¾ in.	40
3 and 3¼ in.	53	3 and 3¼ in.	45
3½ to 4½ in.	54	3½ to 4½ in.	46
5 and 6 in.	47	5 and 6 in.	39
7 to 13 in.	44	7 to 13 in.	36

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipments on sheets of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	2.85 to 2.95
Nos. 9 and 10	2.90 to 3.00
Nos. 11 and 12	2.95 to 3.05
Nos. 13 and 14	3.00 to 3.10
Nos. 15 and 16	3.10 to 3.20

Box Annealed Sheets, Cold Rolled

Nos. 17 to 21	2.70 to 2.80
Nos. 22 and 24	2.75 to 2.85
Nos. 25 and 26	2.80 to 2.90
No. 27	2.85 to 2.95
Nq. 28	2.90 to 3.00
No. 29	2.95 to 3.05
No. 30	3.15 to 3.25

Galvanized Sheets of Black Sheet Gage

Nos. 10 and 11	3.15 to 3.25
No. 12	3.25 to 3.35
Nos. 13 and 14	3.25 to 3.35
Nos. 15 and 16	3.40 to 3.50
Nos. 17 to 21	3.55 to 3.65
Nos. 22 and 24	3.70 to 3.80
Nos. 25 and 26	3.85 to 3.95
No. 27	4.00 to 4.10
No. 28	4.15 to 4.25
No. 29	4.30 to 4.40
No. 30	4.55 to 4.65

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin,	Lead		Spelter	
		Electro-	New	New	St.	New	St.
Sept.	Lake	lytic	York	York	Louis	York	Louis
13	28.00	28.25	38.25	6.75	6.65	9.37½	9.12½
14	28.00	28.25	38.50	6.75	6.65	9.50	9.25
15	28.00	28.37½	38.50	7.00	6.85	9.50	9.25
16	28.25	28.37½	.....	7.00	6.85	9.50	9.25
18	28.25	28.37½	38.25	6.90	6.85	9.62½	9.37½
19	28.25	28.50	38.50	7.00	6.85	9.75	9.50

NEW YORK, Sept. 20, 1916.

Copper continues in active demand; nearby is scarce and higher. Tin has been quiet, but a busier market is indicated. Lead has advanced sharply on all sides, but is now more settled. A good business has been done in spelter, which caused moderate advances. Antimony shows no life.

New York

Copper.—Prices are difficult to determine because of their variation and the large amount of business that has been done very quietly. In the past few days orders for at least 40,000 tons of brass rods and disks have been placed, and the makers have covered their requirements for the material. Nearby metal is scarce, and one producer has announced his withdrawal from the market for the remainder of the year. For the first half of 1917 he asks 27.50c. for electrolytic. Others offer electrolytic at 28c., December delivery, while still others quote 27.75c. to 28c. for the same position and nearby at 28.50c. to 29c. First quarter ranges from 27.50c. to 28c. Lake is entirely nominal, the producers being sold out for the remainder of the year. Altogether a business running into many millions of pounds has been done in the past 10 days. The London market for electrolytic is stronger at £130 10s., against £132 a week ago. The exports of the month, including yesterday, total 16,310 tons. Stock in France and Great Britain on Sept. 15 amounted to 7118 tons, against 7514 tons Sept. 1, a decrease of 396 tons.

Tin.—For the most part the market has been quiet. It is firm, however, and the undertone is good. That a buying movement is not far off is generally held by the trade for several reasons. One is that there has been no lively buying for a long time, and meanwhile old contracts are being liquidated and stocks used up. It is felt that consumers must soon replenish their supplies. On Sept. 13 a moderate amount of interest was shown in futures and some sales resulted. On Monday probably 100 tons of metal changed hands, including spot Straits and Banca, and a little from the Far East. Yesterday the demand for futures was good, but little business resulted, for the reason that sellers would not meet buyers. The arrivals this month total 1590 tons, and there is afloat 3590 tons. The quotation for spot Straits yesterday was 38.50c.

Spelter.—In the past day or two the market has been comparatively quiet, but last week a heavy business was done, a concomitant of the buying of copper by the makers of brass rods and disks. Considering the large quantity of the metal which has been purchased recently, it is considered remarkable that prices have not gone to a higher level than was reached. The quotations for prompt yesterday were 9.75c., New York, and 9.50c., St. Louis. Fourth quarter is held around 9.37½c., St. Louis, and first quarter at 9c., St. Louis. All grades have been active, especially choice brands and prime Western. A good deal of the latter is now being used by the brass mills, which find it satisfactory for certain grades of brass products. The exports continue heavy, those of the month, including yesterday, amounting to 6723 tons.

Lead.—Twice in the week the American Smelting & Refining Company advanced its quotation. On Sept. 14 it raised its New York quotation from 6.50c. to 6.75c., and yesterday it made a further advance to 7c. Up to the time when 6.75c. was passed by the leading interest a heavy business was done, nearly everyone sharing in the activity, but since then, while some good sales are being made, the market has become somewhat spotty. Late last week many sales were made under the surface, the bulk being for prompt and September delivery, to domestic buyers. October sold well also, commanding up to 6.70c., New York. The leading producer at this time was unwilling to sell for October except at an average price. Independent makers have been getting premium prices for some time, and this is held accountable for the advances referred to. They occasioned no surprise, except that it had been wondered why they had not come earlier. Yesterday independents were asking 7c. to 7.10c., New York, and 6.85c., St. Louis. The exports are light, amounting this month, including yesterday, to 771 tons.

Antimony.—The market has continued stagnant. Oriental grades are to be had at 11c., duty paid.

Aluminum.—The market is a little stronger, No. 1 virgin metal, 98 to 99 per cent pure, commanding 61c. to 63c.

Old Metals.—The market continues active. Dealers' selling prices, which are higher, are as follows:

	Cents per lb.
Copper, heavy and crucible	26.00 to 27.00
Copper, heavy and wire	24.50 to 25.50
Copper, light and bottoms	21.50 to 22.50
Brass, heavy	14.00 to 15.00
Brass, light	11.50 to 12.00
Heavy machine composition	19.50 to 20.00
No. 1 yellow rod brass turnings	14.75 to 15.50
No. 1 red brass or composition turnings	16.00 to 17.00
Lead, heavy	6.25
Lead, tea	5.75
Zinc	7.00 to 7.50

Chicago

SEPT. 18.—Sharp advances in copper and lead as the result of large purchases at the end of the week have featured the market. Tin has been somewhat neglected with a tendency toward price shading. We quote: Casting copper, 26.375c.; Lake copper, 28.25c.; tin, carloads, 39c., and small lots, 41c.; lead, 6.75c. to 6.90c.; spelter, 9.50c.; sheet zinc, 15c.; Cookson's antimony, 50c.; other grades, 14c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 19.50c.; copper bottoms, 17.75c.; copper clips, 18.50c.; red brass, 17c.; yellow brass, 13c.; lead pipe, 5.25c.; zinc, 6c.; pewter, No. 1, 28c.; tinfoil, 33c.; block tin pipe, 37c.

St. Louis

SEPT. 18.—Non-ferrous metals have been quiet, closing to-day as follows: Lead, 6.75c. to 6.80c.; spelter, 9c. to 9.25c.; tin, 41½c.; Lake copper, 29c.; electrolytic copper, 28½c.; antimony, 12 to 12½c. In the Joplin ore district the tone was firmer, with zinc blende ranging from $65 down to $50 per ton, with the average for the week $57.50; calamine, $30 to $40, with the average for the week, $39; lead ore, $70, with a few sales reported as high as $75. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 9c.; heavy yellow brass, 12c.; heavy red brass and light copper, 17c.; heavy copper and copper wire, 19c.; zinc, 6c.; lead, 5c.; tea lead, 3.50c.; pewter, 25c.; tinfoil, 31c.

New Export Company Organized

O. Kafka has resigned from the American Steel Export Company and has established the Vulcan Steel Products Company, with offices at 120 Broadway, New York, to carry on a general export business in iron and steel and to represent several independent mills. Salesmen have been engaged to go to various European countries, where they will open offices. Mr. Kafka was associated with the Cambria Steel Company officers who established the American Steel Export Company. The export company became independent of the Cambria Steel Company when the latter was taken over by the Midvale Steel & Ordnance Company.

Another industrial building, for the use of small manufacturers, may be built in Baltimore. Two such buildings have been erected and all the space in them is taken. A. S. Goldsborough, secretary of the Factory Site Commission, City Hall, Baltimore, is seeking capital for the third.

PERSONAL

Important changes in the operating departments of the Ohio works of the Carnegie Steel Company at Youngstown, Ohio, will go into effect Oct. 1. W. E. Donaldson, superintendent of transportation and labor, and for three years in charge of the commercial slag department, will be made special agent for the United States Steel Corporation, and will be placed in charge of the slag department, with headquarters with the Carnegie Company, Pittsburgh. William Griffin, chief of the company's safety department in the Youngstown district for the past eight years, will succeed Mr. Donaldson. Mr. Griffin will be succeeded in the safety department by George Davis, formerly employed in the safety department at the Ohio works, and for some years with the safety department of the company at Sharon and Farrell, Pa., but more recently employed by Worth Bros. Company, Coatesville, Pa. The commercial slag department of the United States Steel Corporation is a new enterprise that has grown up within the past six years, as a result of the good roads movement and the recognized superiority of crushed furnace slag to sand and gravel in such construction.

Homer C. Johnstone, formerly with the Midvale Steel Company, has been appointed manager of the steel department of Gaston, Williams & Wigmore, Inc., 140 Broadway, New York. He served for 14 years as manager of the Chicago and New York offices of the Midvale company.

Elmer E. Yake, Annville, Pa., has been made works engineer for the Gilbert & Barker Mfg. Company, Springfield, Mass. He is a graduate of Lehigh University and was formerly connected with the Maryland Steel Company and the Pennsylvania Steel Company, but more recently with the American Iron & Steel Mfg. Company, Lebanon, Pa.

Walter V. Hill, secretary-treasurer of the S. G. V. Automobile Company, Reading, Pa., has been appointed purchasing agent for the Curtiss Aeroplane Corporation, Buffalo, N. Y.

F. Hallett Lovell, Jr., for many years president and principal owner of the Lovell-McConnell Mfg. Company, Newark, N. J., maker of the Klaxon automobile horn, having sold his interest in the company to the United Motors Company, will remain as a director, but his time will be chiefly devoted to the other manufacturing concerns in which he is interested, among them F. H. Lovell & Co., Arlington, N. J., maker of marine and railroad supplies, of which he is president and principal owner.

J. S. Norris has been appointed sales representative of the Cincinnati Screw Company, Cincinnati, Ohio, and will have offices in the Galt House at Sixth and Walnut Streets. The company's plant is located at Twightwee, Ohio, a Cincinnati suburb.

C. J. Barr, superintendent of the steel plant and furnace divisions of the Tennessee Coal, Iron & Railroad Company at Ensley, Ala., has resigned to accept the management of the Algoma steel mills at Algoma, Ont., Canada. He is succeeded by W. G. Mathias, assistant general superintendent, who went to Birmingham from the Illinois Steel Company. Karl Landgrabe, superintendent of blast furnaces, succeeds Mr. Mathias and is in turn succeeded by W. H. Oldham, superintendent of the company's blast furnaces at Bessemer, Ala., while Superintendent Ledbetter of the Oxmoor furnaces succeeds Mr. Oldham.

The Milwaukee Refrigerator Transit & Car Company, Milwaukee, announces that, effective Sept. 15, the office of traffic manager is abolished. J. J. O'Connor is appointed assistant general manager, in charge of the operating department, and G. G. Allen, assistant general manager, in charge of the manufacturing department.

Franklin G. Hubbard, who for 18 years has been connected with the engineering department of the Western Electric Company's plant at Hawthorne, Ill., has resigned to become associated with the H. E. Harris Engineering Company, Bridgeport, Conn., engineer, designer and maker of special machines, dies and tools. He becomes vice-president of the latter company, and its plant will be under his supervision.

W. H. Eulass, who has been with Joseph T. Ryerson & Son for 17 years, and for the past 4 years manager of the New York office, has resigned, and on Oct. 1 will become connected, in an executive capacity, with the Jewel Tea Company, of which he has been made a director. He entered the employ of Joseph T. Ryerson & Son as a salesman, then becoming general superintendent. In the latter position he had charge of the construction of the Chicago warehouse, one of the best in design and equipment in the country.

George M. Judd has been elected secretary of the American Brake Shoe & Foundry Company, succeeding Henry C. Knox, resigned. Mr. Knox will remain as treasurer.

A. L. Humphrey, vice-president and general manager Westinghouse Air Brake Company, Wilmerding, Pa., has been elected a director and member of the executive committee of the Union Switch & Signal Company, Swissvale, Pa.

S. S. Bean, Winnipeg, Can., has been appointed sales manager of the Janesville Machine Company, Janesville, Wis., succeeding Charles S. Slaker, who resigned to become sales manager of the Stover Engine & Mfg. Company, Freeport, Ill.

Joseph Devereaux, some 20 years with the New York sales office of the Cambria Steel Company, has joined the staff of the American Steel Export Company, Woolworth Building, New York.

F. W. Beach, formerly sales manager of the Massillon Rolling Mill Company, Massillon, Ohio, has been appointed general manager of the La Salle Steel Company, Chicago.

Effective Oct. 1, Joseph T. Ryerson & Son announce the appointment at their New York office of H. B. Heneage as New York sales manager of the commercial division and H. A. Gray as New York sales manager in the railroad and machinery division.

H. L. Lautenschlaeger has been appointed head of the material-follow division of the purchasing department of the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

Archibald G. Smith, general superintendent of the open-hearth steel plant of the Youngstown Iron & Steel Company, Youngstown, Ohio, has resigned, and it is stated will go with the Trumbull Steel Company, Warren, Ohio, which is considering the building of an open-hearth steel plant to supply steel for its sheet and tinplate mills. His successor has not yet been appointed.

Combustion Engineering Salesmen Meet

A meeting of the sales managers and executives of the Combustion Engineering Corporation, 11 Broadway, New York, manufacturer of Type E stokers, Coxe stokers and Grieve grates, was held Sept. 15 and 16. The meeting was called by George E. Learnard, vice-president, in order to enable the men who are directing the sales effort of the company to become more thoroughly acquainted, interchange ideas and become more familiar with a number of recent improvements which have been made in the company's products.

After a meeting lasting from 9 a. m. on Friday until after 5 p. m., a complimentary dinner was given by Mr. Learnard at Sherry's, after which the party attended the New Amsterdam Theatre as his guests. The business meeting was continued on Saturday with short talks by the Chief Engineer, John Van Brunt, and Mr. Learnard, as well as several of the representatives. Those present were: R. C. Beadle, E. H. Finlayson, M. L. Schulte, George Bechtel, C. L. Bachmann, J. C. Brennan, J. M. Hopwood, A. E. Weicket, J. Van Brunt, E. P. Meritz, John Morris, John Morris, Jr., H. Schied, W. S. Robertson, R. H. King, G. E. Learnard, J. V. Santry, J. Hagan, H. T. Thompson, H. H. Leathers, J. T. Beard, Jr., J. D. Harrison, L. E. Pollard, M. P. Talmage, A. B. Natcher and H. E. Kleffel.

Safety Congress; Iron and Steel Section

The National Safety Congress has an attractive program for its fifth annual safety congress to be held in Detroit, Oct. 17 to 20. There are 40 pages, scheduling papers and discussions, and 140 speakers will take part. Every field is included in which safety first has any place, and the results of the deliberations are expected to be important. The program for the iron and steel section on Thursday and Friday mornings, Oct. 19 and 20, is as follows:

"Achievements and Possibilities of Accident Prevention in American Industries," by Dr. F. L. Hoffman, statistician, Prudential Life Insurance Company, Newark, N. J.

"Employment," by A. H. Young, supervisor of labor and safety, Illinois Steel Company, South Chicago, Ill.

Discussion by J. M. Larkin, secretary safety committee, Fore River Shipbuilding Company, Quincy, Mass.

"Origin of Safety Methods and Prevention of Infection," by Dr. C. C. Booth, chief surgeon, Republic Iron & Steel Company, Youngstown, Ohio.

Discussion by Dr. L. A. Shoudy, chief surgeon, Bethlehem Steel Company, South Bethlehem, Pa.

"The Duties of the Visiting Nurse," by Miss Florence Wright, Clark Thread Company, Newark, N. J.

"Safety in Rolling Mill Operations," by Charles R. Hook, general superintendent, American Rolling Mill Company, Middletown, Ohio.

Discussion by P. R. Baker, assistant general superintendent, Lukens Iron & Steel Company, Coatesville, Pa.

"Electric Hazards," by D. M. Petty, superintendent electrical department, Bethlehem Steel Company, South Bethlehem, Pa.

Discussion by S. C. Coey, assistant master mechanic, Youngstown Sheet & Tube Company, Youngstown, Ohio.

"Safety in Coke Oven Operations," by K. M. Burr, safety inspector, Illinois Steel Company, Gary, Ind.

General discussion.

"Police and Fire," by G. W. Atwood, Youngstown Sheet & Tube Company, Youngstown, Ohio.

Report of nominating committee and election of officers.

Employers' Association of Rhode Island

A group of 146 employers, representing more than 50 different industries and employing more than 60,000 hands, at a meeting in Providence, R. I., Sept. 14, organized the Employers' Association of Rhode Island. It will have permanent offices at 421 Butler Exchange Building, Providence. The following declaration of principles was adopted:

We stand primarily for law, order and industrial peace, but oppose all oppressive restrictions which retard progress and interfere with the individual liberty of the employer as well as the employee.

We stand for the open shop and oppose limitations of output, restriction as to the use of tools, machinery or material except such as are unsafe.

We oppose the boycott, the sympathetic strike and the compulsory use of the union label.

We recognize the right of the employee to organize, but hold that any such organization should not interfere with the right of the individual to work as he sees fit.

The officers elected for the coming year are as follows: President, M. J. Houlihan; vice-president, Webster Knight; secretary, E. L. Walker, Jr.; treasurer, Frederick A. Ballou. Board of Managers, Henry D. Sharpe, John P. Farnsworth, L. W. Downes, Walter A. Field, R. W. Reid, W. C. Fisher, T. W. Waterman, Henry S. Chaffee and William L. Sweet.

Norway's Copper Supply

Information has just reached the U. S. Department of State to the effect that an agreement has been entered into between the governments of Great Britain and Norway whereby the latter places an embargo on the exportation of raw copper and receives uninterruptedly copper importations from the United States but releases an amount equivalent to such importations for shipment to England. The amount at once available is said to be 3000 tons.

The Brown & Sharpe Mfg. Company, Providence, R. I., has opened an office in Pittsburgh, Pa. in room 2538, Henry W. Oliver Building. This office will be in charge of J. F. Lyon.

OBITUARY

MATHIAS PFATISCHER, consulting engineer of the Electro Dynamic Company, Bayonne, N. J., died in Roselle, N. J., Sept. 10, after having been with the company for 27 years. He was an electrical engineer and a prominent inventor. He invented the electric steering gear, with which battleships, naval cruisers and other vessels are equipped. He designed the electrical equipment on the first two large steamships built in the United States, the St. Louis and St. Paul, which included several novel features, such as the electric ship telegraph, propeller shaft electrical revolution indicators and electric rudder indicator, also being the originator of running wires in conduit aboard steamships, etc. He was instrumental in developing a single phase alternating current motor about 18 years ago, which is known to-day as the Wagner a. c. motor. In 1904 he invented the inter-pole variable speed motor, which revolutionized the design of direct current motors, and in 1908 was awarded the John Scott Medal by the Franklin Institute of Philadelphia for this invention. He was a member of the American Institute of Electrical Engineers, Electric Power Club, Technical Society of New York, Franklin Institute and Elektrotechnische Verein Society of Berlin, Germany. He leaves his widow and one daughter.

ALEXANDER TALMAN WHITING, vice-president and secretary of the Whiting Foundry Equipment Company, Harvey, Ill., died Sept. 12 at his home in Chicago, aged 64 years. He was born at Sault Ste. Marie, Mich. After residing in Detroit for many years, he removed to Chicago in 1893 and with his brother, John H. Whiting, established the Whiting Foundry Equipment Company. He was prominent in the Illinois Manufacturers' Association and the Chicago Association of Commerce. He leaves his widow, one son and two daughters.

JAMES DAVID MILLER, secretary and treasurer of the Auto Parts Mfg. Company, Milwaukee, died suddenly from apoplexy Sept. 10, aged 62 years. He had been a resident of Milwaukee for 30 years. He was assistant superintendent of the Allis-Chalmers main works until 1912, when he resigned to become manager of the Auto Parts Company.

ALEXANDER WATSON BLACK, one of the organizers and formerly a director of the Pittsburgh Crucible Steel Company, died at his home on Sewickley Heights, near Pittsburgh, Sept. 17, aged 69 years. For about 20 years he was connected with the Black Diamond Steel Works of Park Brother & Co., Ltd., at Pittsburgh.

SAMUEL C. PRATT, member of the firm of Beals & Co., Buffalo, wholesale iron, steel and hardware merchants, died Sept. 15 after an illness of about one month. He had been active in the extensive business of the firm for more than 25 years.

New Shipyard Lays Its First Keel

The Pennsylvania Shipbuilding Company laid the keel of its first ship—a 7000-ton oil tanker—at its Gloucester (N. J.) plant Sept. 9, in the presence of the officers of the company, city officials, Government marine inspectors and officials of other shipbuilding companies. Although the work of constructing the new shipyard was started only six months ago, and several of its buildings are still incomplete, work will be rushed on the first ship, and in the near future keels of other ships intended for the merchant marine will be laid.

The company is building six 7000-ton oil tankers and four 12,500-ton cargo boats. All will be equipped with steam turbines and reduction gears for a speed of 11 knots. The main office of the company is in the Land Title Building, Philadelphia. The officers are H. E. Norbom, president; Charles H. Moyer, vice-president; Henry Lysholm, general manager, and George S. Hoell, secretary and treasurer.

Pittsburgh and Nearby Districts

The Jones & Laughlin Steel Company, Pittsburgh, has started a butt-weld furnace at its new tube plant at Aliquippa, Pa. One more butt-weld and two lap-weld furnaces are being built and will be completed this year.

The Brier Hill Steel Company, Youngstown, Ohio, in one day recently turned out 1700 tons of semi-finished steel and has started another soaking pit furnace in its steel plant to take care of additional output.

The Youngstown Iron & Steel Company, Youngstown, Ohio, will make large additions to its pressed steel department. A new building, 80 x 160 ft., will be erected, while the present building, 80 x 300 ft., will be remodeled. The contract for the structural steel has been placed with the Hunter Construction Company. The company is operating its open-hearth steel plant at Lowellville and its sheet mills and pressed steel department at Youngstown to their utmost capacity, with orders ahead for some months.

The Chamber of Commerce of Massillon, Ohio, in order to induce new industries to locate in that city, has decided to engage in an advertising campaign. The board of directors has made a liberal appropriation for the purpose and the work will start in a short time.

The payroll disbursement in the Youngstown district for August was $3,888,129. This was a gain over July of $163,138 and a gain over August, 1915, of $1,286,597. The September payroll is expected to reach $4,000,000.

The Pittsburgh & Lake Erie Railroad has been ordered by the Interstate Commerce Commission to pay the Pittsburgh Steel Company $14,186.25, with 6 per cent interest from Nov. 1, 1913, for excess freight charges. Certain allowances are made to steel companies in the Pittsburgh district having their own locomotives for transferring cars from the main lines to the mills by the railroad named. The allowance had not been made to the Pittsburgh Steel Company, which applied to be placed on the same basis as others.

The Standard Screw Company, Corry, Pa., has been incorporated with a capital of $20,000 by S. V. Stewart, F. N. Ames, L. R. and C. F. Bliss, and L. T. McElroy.

The National Forge & Tool Company, Erie, Pa., states that it has not yet decided to remove its plant from Erie to Irvine, Pa., as reported. It is possible that its plants at Irvine and Erie may be consolidated next year.

Within the next six weeks or two months the output of open-hearth steel at Farrell and Sharon, Pa., will be greatly increased. The Carnegie Steel Company is building three 60-ton open-hearth furnaces at Farrell, which will be completed about Oct. 1, and will increase the steel output at this plant about 12,000 tons per month. The American Steel Foundries has completed one 60-ton furnace at its Sharon plant and a second will be ready in a month or six weeks. The six open-hearth furnaces at the Sharon works of the Carnegie Steel Company have been rebuilt for using powdered coal and a large increase in output is expected. The Shenango Valley is now making a very much larger output of open-hearth steel than ever before in its history.

The Edgewater Steel Company, Pittsburgh, which has taken over the Kennedy-Stroh Corporation, has increased its stock from $5,000 to $2,000,000, filing notice of its action with the State Department at Harrisburg.

The Huntington Alloy Company, Huntington, W. Va., has been succeeded by the Steel Products Company, incorporated by Thomas W. Harvey, R. P. Aleshire, secretary and treasurer, Paul Hardy, and others, with a capital stock of $100,000, and is continuing the manufacture of war munitions.

Cherry Valley furnace of M. A. Hanna & Co., at Leetonia, Ohio, which was blown out Aug. 5 for relining and repairs, will go in blast again this week on foundry iron.

The Carnegie Steel Company, fearing a shortage in the supply of natural gas this winter, is making a pulverized coal installation at its Homestead works to supply fuel for 24 open-hearth steel furnaces and a similar installation at its Clairton works to supply fuel for 8 open-hearth furnaces. This is not a new move by the Carnegie company, as pulverized coal has been used for several years for fuel in the open-hearth steel plant at its North works at Sharon, Pa. The two plants at Homestead and Clairton are expected to be ready for operation about Dec. 1. Last week the idle Edgar Thomson furnace of the company was put in blast after being extensively repaired and relined, and all of the 11 Edgar Thomson furnaces are now in operation. The company has only four of its 59 blast furnaces idle. These are one Bellaire at Bellaire, Ohio, which is being rebuilt; one Lucy and one Isabella at Pittsburgh, which are being relined, and the Zanesville, Ohio, stack, an isolated furnace which has not been active for some years.

The first of the fall and winter meetings of the Pittsburgh Foundrymen's Association was held in the Fort Pitt Hotel on Monday evening, Sept. 18, preceded by a dinner. The attendance was fairly large. Dean Holsworth, University of Pittsburgh, made an interesting address on "Preparedness." Ralph Hickman, Richmond Radiator Corporation, Uniontown, Pa., was elected an active member.

The Keystone Rubber & Tire Company, Pittsburgh, will establish a plant at Penn Station, on the main line of the Pennsylvania Railroad, 25 miles from Pittsburgh, for the manufacture of automobile truck tires. The company will occupy a three-story steel and brick building, 60 x 190 ft., with power house, and expects to be manufacturing in about 90 days.

Sheet and tin-plate workers employed in mills that sign the Amalgamated Association scales will receive an advance in wages of 3 per cent dating from Sept. 1. The sheet workers are now receiving 12 per cent over the base of the scale, which is 2.15c. for gages 26, 27 and 28, Bessemer black sheets. Tin-plate workers are now receiving 11 per cent over the base of the tin-plate scale, which is $3.50 per base box for 14 x 20 bright plate.

The Union Drawn Steel Company, Beaver Falls, Pa., manufacturer of cold rolled steel shafting, will build a new plant at Gary, Ind., work on which will start as soon as plans have been completed. The main building will be 150 x 456 ft. The steel required, about 1000 to 1100 tons, has been placed with the American Bridge Company at Pittsburgh. The same line of products will be made at Gary as are now made at Beaver Falls.

Effective Monday, Sept. 18, the McKeesport Tin Plate Company, McKeesport, Pa., gave its hot tin-mill workmen, shearmen and openers an advance in wages ranging from 10 to 20 per cent, depending on the class of labor. This company is now operating 35 hot tin mills, will start 5 more in a few days, another about Oct. 1, and the final mill about Dec. 1.

Sheet and Tin-Plate Association Organized

Walter W. Lower, formerly chief cost accountant of the Pittsburgh Crucible Steel Company, Midland, Pa., and prior to that with the Lackawanna Steel Company, Buffalo, N. Y., has been elected secretary and treasurer of the National Association of Sheet & Tin Plate Manufacturers, organized at Pittsburgh in the latter part of July. He assumed his new duties on Sept. 18. The other officials are W. S. Horner, W. S. Horner & Co., Pittsburgh representatives of the American Rolling Mill Company, Middletown, Ohio, president, and Joseph B. Andrews, Newport Rolling Mill Company, Newport, Ky., vice-president. The association has opened headquarters in rooms 421-422 Oliver Building, Pittsburgh. No meetings have been held since early in the summer, but a meeting will be held late this month. The first work the association will take up will be the adoption of a standard form of contract for the sale of sheets and tin plate, probably the same form of contract adopted some time ago by the American Iron and Steel Institute. A standard method of arriving at costs will also be taken up at an early date.

The Iroquois Iron Company, Chicago, has increased its capital stock from $5,000,000 to $6,000,000.

New Foundry Trade Advance at Cleveland

(*Continued from page* 646)

duce the manganese content on account of the high price of ferromanganese. Such grades of steel averaged in carbon 0.10 to 0.65 per cent, in manganese 0.60 to 0.75 per cent, in silicon 0.22 to 0.25 per cent. I treated such steels with 8 lb. per net ton of an alloy containing 15 per cent of titanium, being the same alloy as that used by Mr. Janssen, and each time the manganese was around 0.45 to 0.50 per cent and the sulphur about 0.40. The ingots always started to manifest red shortness by cracking at the rolling mill, and I assumed that this was produced largely by the high sulphur and low manganese content, and not by any oxide left in the steel; since such steels had a high silicon content and had been treated with titanium as a final deoxidizer and cleanser.

What I wish to make clear is that I do not think that it is possible safely to diminish the manganese content of steel for castings from 0.75 to 0.50, as stated by Mr. Janssen, by merely using 6 lb. of 15 per cent ferrotitanium per ton of steel, and that if it is possible the titanium has nothing to do with it. However, such steel, if treated with titanium will be certainly found cleaner and freer from segregation, regardless of the manganese content.

Mr. Janssen, in replying, held that the question of titanium as an alloy is a moot question, and that if titanium is present in the steel it does not have the same function as manganese, vanadium, etc. If it should possess any merit as an alloy, as determined later, it would be better to use the carbon-free alloy to introduce the titanium. The question of the amount of the alloy necessary depends on whether the prevention of segregation as well as the deoxidation of the steel is the end desired. He insisted that vanadium is a deoxidizer, and that most metallurgists believe it to be, while nickel and chromium are merely alloying elements.

As to the use of titanium as a substitute for manganese, Mr. Janssen asserted that he had been able to reduce his manganese content from 0.75 to 0.50 per cent by the use of titanium and still obtain as good and better static properties; that 0.20 per cent carbon steel with 0.75 per cent manganese without titanium hardly ever exceeded 62,000 lb. per sq. in. in tensile strength, whereas by the use of titanium and a reduction in manganese to 0.50 per cent, the tensile strength of the treated steel rose to 68,000 lb. per sq. in. This had been hit upon in seeking some method of conserving the ferromanganese supply. He understood others had tried to do the same thing, but with poor success. In his furnace practice he insisted on the use of a pig iron containing 1 to 1.50 per cent manganese.

EFFECT OF MANGANESE IN PIG IRON

Edwin F. Cone spoke of the results obtained by Mr. Janssen in substituting titanium for manganese as remarkable, but raised the question whether the use of a manganese pig iron in the charge should not be given the credit. A manganese pig iron is becoming recognized as more important in the production of basic steel because of the beneficial effect of the manganese in neutralizing oxidation during the melting and refining, and it is becoming more generally recognized that the steel is better from the use of such a pig iron. Mr. Cone believed a distinction should be kept clearly in mind between the addition of titanium alloy to acid steel and to basic steel.

In reply to a question as to the time and form in which the titanium alloy was added, whether in slabs or lumps to the bath or as small lumps to the ladle, and whether before or after the silicon and manganese, Mr. Janssen said that he had found the best results to proceed from adding the alloy in very small pieces to the metal in the ladle after the silicon and manganese additions.

An important discussion was submitted by L. Selmi, chief chemist and metallurgist of Corrigan, McKinney & Co., Cleveland, Ohio, as follows:

I do not care to call my work research work, but it covers about 120 heats of acid open-hearth steel for casting rolls. Of these 30 were cast straight with no addition whatsoever; 30 were treated with aluminum in the ladle in varying amounts of 4 ounces to one pound of aluminum per ton of steel; 30 were treated with Goldschmidt carbon-free titanium alloy in varying amounts of from 2 to 4 lb. of alloy per ton of steel; 30 were treated with ferro-carbon-titanium from 3.5 to 10 lb. of alloy per ton of steel. All of these heats were of acid steel made in 20-ton furnaces and the carbon varied from 0.50 to 1.10 per cent. They were used in casting large rolls so that only one roll was obtained from a 20-ton heat. Our object in doing this was to find out the treatment which would enable us to make the best rolls free from segregation and blow holes. Great care was taken to keep a complete record of the heats as well as that of the working condition of the furnace.

The temperature of the steel was taken with a Simatco pyrometer at tapping time and also at casting from the ladle. In all of these heats, with no exception, the ladle was held for 10 minutes. We endeavored to vary the tapping temperatures with the analysis of the steel wanted. The average Fahrenheit temperature of the steel as we observed it was:

	Temperature, Deg. Fahr. From Furnace	Temperature, Deg. Fahr. From Ladle	Difference, Deg. Fahr.
1—No addition	2,850	2,770	80
2—Aluminum addition	2,840	2,780	60
3—Goldschmidt titanium addition	2,900	2,850	50
4—Ferro-carbon titanium addition	2,940	2,780	160

The apearance of the rolls disclosed that those that had received no treatment whatever and those that had been treated with the Goldschmidt titanium alloy were by far the best. Next in line were those treated with aluminum, but the least success was experienced with those treated with the carbon titanium.

The nature of the defects encountered in these rolls were pine tree crystal structures in pockets and numerous blow holes which invariably settled on the upper part of the rolls. A large uniform sink-head was allowed for all the rolls because we tried to have as near the same condition in each case as was consistent with practice.

All these rolls were examined under the microscope, and a specimen taken from the same position in each case; these revealed that in the first three experiments very small amounts of slag inclusions were present. In the fourth, besides all the small amounts of slag inclusions, there were noticeable blow holes and pine tree structures which were surrounded by a thin film of slag. In all of the rolls that were treated with the Goldschmidt alloy we also noticed that small crystals known as pink slag or titanium nitride were present. This proved to us that the titanium alloy added reacted with the nitrogen occluded in the steel and was thereby changed into titanium nitride, which passed out as slag, on account of its low specific gravity, but leaving very small traces behind entrapped in the steel.

In the carbon-titanium rolls we failed to observe such pink slag and to us this was sufficient proof that the carbon titanium had not dissolved at the temperature of the steel and therefore had failed to cause any reaction with the steel other than the reaction of the graphitic carbon contained in the titanium alloy, which reacted with the oxides of the slag as soon as the slag touched the ladle causing the slag to foam over on every heat. We also interpreted that the drop in temperature that was observed in the carbon-titanium heats was caused by this very reason that the reaction of the graphitic carbon with the oxides of the slag formed large amounts of carbon monoxide which had to find its way out of the slag and, in doing so, caused the slag to froth up in open channels. So the radiation losses were greater than in the case where the Goldschmidt alloy was used, as in this case the slag blanket did not raise up but remained quiet on the top of the metal.

The average analyses of the titanium used were as follows:

	Goldschmidt, Per Cent	Carbon Titanium, Per Cent
Titanium	25.50	12.00
Manganese	0.60	Trace
Carbon	0.00	6.50
Aluminum	5.75	0.00
Silicon	0.35	1.50

Phosphorus and sulphur were not determined but were present in the alloys in very small quantities.

G. F. Comstock of the Titanium Alloy Mfg. Company asked Mr. Selmi whether a microscopic examination of the slags did not reveal the pink crystals or slags when the carbon-titanium alloy was used, but none when the carbon-free alloy was used. In reply

Mr. Selmi said his examination had also extended to the slags microscopically, and that he found no pink slag in the slag when the carbon titanium had been used but a large amount in slag from a heat treated with the carbon-free alloy.

As a substitute for manganese Mr. Selmi said he had never been able to obtain any satisfactory results from using a titanium alloy.

ACID AND BASIC STEEL FOR CASTINGS

The question of the relative merits of acid or basic steel for castings was treated by Edwin F. Cone, New York, in a paper, "Acid vs. Basic Steel for Making Castings." The chairman stated that for a long time the committee had desired this subject discussed, offering it at one time to an acid steel foundryman, who replied that there was nothing to say, since acid steel was best. Obtaining a similar refusal from a manufacturer of basic castings, it was decided to call on a neutral.

The principal discussion was offered by President R. A. Bull, who read in part as follows:

The significant dividing line between acid and basic castings is not that which falls between foundries making castings to be machined and those which do not, but is a geographical one separating the East from the Middle West. The manufacture of steel castings in this country naturally began in the Eastern States, and at a period when deoxidizers were employed with indifferent success. About the time when steel foundries began to flourish in territory contiguous to the Mississippi, the manufacture and use of satisfactory deoxidizers experienced important development. The example of the Western pioneers in the steel casting industry in experimenting with the treatment of metal made on a basic bottom was followed by many progressive founders in the Middle West. The East has been slow to discontinue its acid practice. Most of its foundry melters do not favor a change to conditions with which they are inexperienced. Meanwhile, in the Central and Western States, the success attending basic practice for general steel foundry work has justified those who pinned their faith to it.

The West has taken the lead in developing several phases of steel foundry practice, notably molding in green sand. Not longer ago than nine years since a prominent Eastern technical journal published over the signature of one of its staff a statement that substantially affirmed the impossibility of making steel castings in green sand. At that time, probably 20 per cent of the tonnage of steel castings made in this country was molded in green sand in Central and Western States.

The reduction in the silicon content, which Mr. Cone claims often amounts to 50 per cent, is not really a serious matter. It would be if 50 per cent were an average decrease, and if an appreciable quantity of steel were thus affected.

The percentage of metal affected by reduced silicon content is an important factor to which Mr. Cone refers only by the indefinite phrase "the last part of the heat." And to absolve basic founders from prejudice, we will here admit to a reduction not only in silicon content but in manganese content, to which latter fault Mr. Cone makes no reference.

Analyses of hundreds of 58,000-lb. basic heats requiring an average time of 50 minutes to pour, in a steel foundry whose practice is not claimed as superior to that of other well-regulated shops, show that no appreciable change in composition occurs under anything like normal conditions except in the last 1000 lb. teemed. The observant foundryman has convenient means at hand for partly controlling and wholly ascertaining this change. Control is gained by maintaining to reasonable depth the slag covering the metal in the ladle. Experience shows that an excessive amount of slag has greater influence on the chemical composition of the underlying metal than does a moderate coating required for heat conservation. Determination of the extent of change is, of course, by holding for chemical analysis the castings poured in the last part of the heat.

The extent to which changes occur under average conditions may be intelligently gaged by quoting average silicon and manganese determinations of a month's run in a large basic foundry which melted approximately 6600 tons of metal last month. The average percentage of silicon in the metal poured in the middle of each heat was 0.36 per cent, while the percentage of the same element in the last metal out of the nozzle was 0.264. Corresponding tests for manganese showed, respectively, 0.77 per cent and 0.68 per cent. The maximum loss in silicon content averaged 26 per cent, while that for manganese content averaged 11.7 per cent. I submit the question if such losses are serious when confined to 2 per cent of the metal lying just beneath the slag, particularly when the pouring of flask and other shop equipment whose perfect homogeneity is unnecessary, calls for a considerable portion of such percentage?

As to results in the castings to be machined, extended experience shows conclusively that the use of acid scrap is quite unnecessary in the attainment of steel castings, most of which requir machining and which are condemned on rigid railroad inspection, if not reasonably free from porosity, and if not possessing physical properties in conformity with recognized specifications.

Mr. Cone has referred in general terms to some remarkable results in the physical properties of basic steel castings, as compared with those made from acid steel. This might reasonably be attributed to the greater purity of basic steel whose phosphorus and sulphur percentages are appreciably lower than can be obtained in acid practice under commercial conditions. Those who make frequent physical tests of steel representative of properly made basic castings will testify to its excellent quality. The foundryman is interested in still another factor, namely, the ability to cast successfully in basic steel designs peculiarly susceptible to shrinkage cracks, very difficult to make in acid steel.

Mr. Cone's figures show a gradual tendency of acid steel to lose favor in the foundry industry. Whereas 15 years ago the percentage of acid steel was 68.4 per cent, two years ago it had fallen to 44.7 per cent. The rise to 54.7 per cent in 1915 is, in my opinion, not due to a change of preference on the part of steel founders generally, but to the scarcity and high cost of basic linings in the past two years, due to the European war.

To a question as to whether hydraulic castings had ever been successfully made in basic steel, Mr. Cone testified that while excellent castings for such purposes had been made of acid steel, unusually superior ones had been made from acid scrap on a basic bottom, as referred to in the paper. As to a difference microscopically, the author stated that the few samples of basic steel he had examined all showed less ingotism than acid steel, though this could not be offered as final or conclusive.

"Theory and Practice in Gating and Heading Steel Castings" was presented by Ralph D. West, West Steel Casting Company, Cleveland, who offered some valuable evidence and suggestions from practical experience. In reply to Mr. West's question whether any of the foundrymen present were using chills extensively, Jacob Walther, Dayton Steel Casting Company, Dayton, Ohio, said that he used them as much as possible the year around in preference to brackets, etc.

The two other scheduled papers, "Alloy Steel Castings," by David Evans, Chicago Steel Foundry Company, Chicago, and "The Small Open-Hearth as a Flexible Unit for Either Large Steel Foundries or General Jobbing Shops," by Frank Carter, Milwaukee, Wis., were not presented.

John Howe Hall, as chairman of the association's committee on specifications for steel castings, made a detailed report at the opening of Friday's session. Reference will be made to this in a later issue.

Gray Iron Founders' Session

With Benjamin D. Fuller presiding, the section of the association especially interested in gray iron castings met on Friday morning. The first paper, "The Effects of Different Mixtures on the Strength of Chilled Car Wheels," was presented in abstract by the author, G. S. Evans of the Lenoir Car Works. The data and photomicrographs presented in the paper were the result of tests extending over a period of two years, in which results were especially sought showing the effect of varying percentages of coke and charcoal pig iron. In all, some 60 different mixtures were cast, the percentages of scrap, charcoal and coke pig being varied between minimum and maximum limits. The paper goes into detail regarding various typical mixtures,

giving also the drop and thermal tests, Brinell hardness and transverse strength. The conclusions are that no gain in strength is obtained by increasing the percentage of either charcoal or coke pig iron beyond approximately 12 per cent and that the substitution of charcoal pig iron for coke pig does not result in any clearly defined beneficial effect on the strength of the wheels as shown by various tests. The experiments seemed to show that charcoal iron losses its special properties when remelted in the cupola. The effects, if any, of the different mixtures on the microstructure of either the chilled or gray portions of the finished wheels are not such as to be clearly defined. The foundry practice, including the melting, casting and annealing, appears to be largely responsible for the ultimate strength of the finished wheels; and the greatest possible source of betterment of the output as a whole results from the standardization of this practice.

It was brought out in the discussion that the line of demarkation between the chill and gray portions of the wheel metal section appears not to be affected by the proportions of charcoal or coke iron used. High silicon iron accentuates this distinction and gives a sharply cut-off chill. Ferromanganese was used only to bring the manganese in the finished product up to a certain standard, the amount varying only within a small range, depending upon the analysis of the pig. The ferromanganese was introduced through the cupola.

SEMI-STEEL FOR CASTINGS OF THIN SECTION

In presenting the subject of semi-steel, David McLain, Milwaukee, refrained from reading the text of his paper, contenting himself with a description of the numerous photomicrograph illustrations as they were thrown upon the screen. The points brought out, both by Mr. McLain and in the discussion, have been largely touched upon at other times in THE IRON AGE, the principal emphasis being placed upon the necessity of using good coke and, where a high percentage of steel scrap is used, of pouring the metal amply hot. Semi-steel is a high carbon metal, the steel scrap being responsible for a large absorption of carbon from the coke. The micrographs also show that hard spots are not found in semi-steel and the many samples of semi-steel castings shown by the author of the paper illustrate the adaptability of semi-steel to the manufacture of thin section castings.

HIGH-CARBON COKE ESSENTIAL

In another issue the interesting paper covering the "Use of By-Product Coke in Foundries," by George T. Long, Chicago, will be given quite fully. The paper left little opportunity for discussion other than to give new emphasis to the important bearing of a good quality coke, both as to structure and carbon, upon the character of the castings. It was pointed out that coke running 88 to 90 per cent in carbon can always be had if that specification is insisted upon, and also that by-product coke is not different from beehive coke in that the best structural quality is obtained from those coking periods during the week which are most protracted, as over the week end.

The paper by Prof. Thomas Turner, University of Birmingham, England, "The Thermal Reactions of Cast Iron," was read by title and at the suggestion of Chairman Fuller a vote of thanks was extended to the author for this contribution at a time when conditions in Great Britain are so unfavorable to such effort.

USING ALL-SCRAP MIXTURES

The use of cheaper materials as outlined in a paper of that title by Charles C. Kawin, Chicago, had to do with the employment of large percentages of scrap in cupola mixtures, the paper pointing out that all-scrap mixtures are quite practicable with the use of some ferromanganese and the author giving four suggested mixtures typical of an all-scrap charge. Mr. Kawin contends that except for such differences as may be due to mechanical conditions associated with the pouring of castings in the foundry, the results obtained in castings depend entirely upon the analysis of the metal poured, regardless of the materials from which that metal is melted.

BORINGS IN THE CUPOLA

In the absence of Mr. Murphy, the author, the paper on "The Use of Borings in Cupola Operation," was read only by title. The paper covers the subject generally and will be abstracted in a later issue. The discussion of the paper indicated that foundries using borings have, in general, secured approximately similar results. To use them with good results, it appears to be necessary that they be inclosed in a container or held together in briquettes instead of being charged loosely and that the percentage of borings in relation to the charge must not be too high, or hardening and shrinkage of the iron will result. The borings also should be clean and free from oxidation. Dr. Moldenke, in a written discussion of the paper, predicted the increased use of briquetting in the preparation of borings for cupola melting as against the method of charging them in cans, stove pipe or other containers which, at best, is an unsatisfactory arrangement. The discussion will be more fully reported in connection with the paper.

Business and Social Features

In the elevation of the senior vice-president, J. P. Pero, to the presidency of the American Foundrymen's Association for 1916-1917, the nominating committee's report followed precedent. Benjamin D. Fuller, Cleveland, was chosen senior vice-president, and A. O. Backert, Cleveland, was re-elected secretary-treasurer. The list of directors for the ensuing year includes, in addition to past presidents and present vice-presidents, representatives of the exhibit function of the association, and is as follows: R. A. Bull, Granite City, Ill.; C. E. Hoyt, Chicago; H. B. Swan, Detroit; B. D. Fuller, Cleveland; Stanley G. Flagg 3rd, Philadelphia; S. B. Chadsey, Toronto, Ont.; Alex. T. Drysdale, Burlington, N. J.; Alfred E. Howell, Nashville, Tenn.; J. P. Pero, East St. Louis, Ill.; S. T. Johnston, Chicago; A. O. Backert, Cleveland; H. S. Covey, Cleveland; Maj. Joseph T. Speer, Pittsburgh; V. E. Minich, New York; H. A. Carpenter, Providence, R. I., and W. A. Janssen, Davenport, Iowa.

At a business meeting on Friday the association adopted a resolution in which it joins with other technical societies in urging upon Congress additional financial assistance for the conduct of the work of the Bureau of Standards.

The report of the committee on resolutions expressed appreciation of the excellent work done by those officers of the association who had had the direction of the exhibit and acknowledged the great success of the undertaking.

The meeting concluded with the induction into office of President-elect Pero and the senior vice-president, Benjamin D. Fuller.

The Annual Banquet

The purpose of the executive officers that the annual banquet of the American Foundrymen's Association shall reflect the most wholesome social aspects of the convention was carried out with signal success. Ladies attended in almost equal number with the men. An atmosphere of close personal association was created. A gracious contribution to the program was the singing of a number of songs by Miss Pero, the daughter of the president. The presentation of a chest of silver to the retiring president, R. A. Bull, was a feature of unusual interest, indicative of the spirit of co-operation and personal regard which has been created in the executive board of the association. President Pero's remarks were exceptionally happy.

The address by the Secretary of War, Newton D. Baker, was not disappointing to those who are well acquainted with his exceptional ability as an orator. He spoke of "Nation Building" in a patriotic rather than

a political vein, linking the activities of the foundry industry and all industry with the problem of national welfare.

The enterprise which marked all the work of the Cleveland committee was strikingly evidenced in the showing of moving pictures during the banquet and at its close. Pictures of association and local officers were thrown on the screen and in addition over 1000 ft. of film, covering the plant visitation, entertainment features and views in the machinery exhibit.

Visits to Cleveland Foundries

The plant visitation program was one of the important features of the convention. A large number of visiting foundrymen took advantage of the opportunity afforded to inspect a number of the leading Cleveland foundries that threw open their doors. These included the foundries of the Ferro Machine & Foundry Company, the Interstate Foundry, the Allyn-Ryan Foundry Company, all specializing on automobile castings; the new continuous foundry of the Westinghouse Electric & Mfg. Company; the plant of the West Steel Castings Company, which specializes on light steel castings; the heavy gray iron foundry of the City Foundry Company, specializing on machinery work, and the stove foundry of the Best Foundry Company in the suburb of Bedford. Other plants were also visited, including malleable, steel and brass foundries. A great deal of interest was shown in the up-to-date molding machines and other equipment in operation. An interesting trip was that made to the blast furnaces of the Cleveland Furnace Company on the Cuyahoga River flats, automobiles being provided for taking the foundrymen to this plant.

Success of the Exhibition

The foundry exhibition was pronounced the most successful ever held, both in point of attendance and in number of sales made by the exhibitors, as well as in the character of the exhibits, as described in these columns last week. While other exhibits have drawn as large an attendance, none have been witnessed by so many men connected with foundries and directly interested in the equipment shown. The exhibitors report a very gratifying number of orders. The great interest taken in foundry machinery is attributed in some degree to the present prosperity of the foundry industry, also to the scarcity and high price of labor, causing foundry managers to add labor-saving equipment wherever possible. The exhibit was kept open during the day, starting with Tuesday and closing Saturday afternoon.

Record Sessions of Institute of Metals

Discussions at the Cleveland Convention Deal Largely with Brass Foundry Practice — The Evolution of Die Casting

The convention of the American Institute of Metals at Cleveland last week had an attendance much larger than usual and the papers presented were nearly all on topics of a general interest, bringing out considerable discussion. The registration of members exceeded 150, as compared with about 100 in previous years. Sessions for the presentation of papers were held on Wednesday, Thursday and Friday forenoon in addition to the joint meeting with the American Foundrymen's Association on Tuesday.

OFFICERS RE-ELECTED

During a business session held at the closing meeting Friday, Jesse L. Jones, Westinghouse Electric & Mfg. Company, East Pittsburgh, was re-elected president and W. M. Corse, Titanium Alloy Mfg. Company, Niagara Falls, N. Y., was re-elected secretary. George C. Stone, New Jersey Zinc Company, was elected first vice-president, and other vice-presidents were elected as follows: R. S. B. Wallace, National Cash Register Company, Dayton, Ohio; William B. Price, Scovill Mfg. Company, Waterbury, Conn.; G. K. Burgess, U. S. Bureau of Standards; DeCourcy Browne, Goldschmidt Thermit Company, New York; Harold J. Roast, James Robinson Company, Montreal; G. P. Salter, Ohio Brass Company, Mansfield, Ohio; F. H. Schultz, H. B. Mueller Mfg. Company, Decatur, Ill.; W. A. Cowan, National Lead Company, and H. S. Gulick, Moore-Jones Brass & Metal Company, East St. Louis, Mo.

The officers were selected by a nominating committee appointed at the Wednesday session, consisting of N. K. B. Patch, Lumen Bearing Company, Buffalo, N. Y.; G. H. Clamer, Ajax Metal Company, Philadelphia, and L. W. Olson, Ohio Brass Company, Mansfield, Ohio. The ticket named was unanimously elected. Mr. Cowan was appointed chairman of the committee on papers for the ensuing year.

NO MERGER WITH FOUNDRYMEN'S ASSOCIATION

The Institute took formal action declining to merge with the American Foundrymen's Association, deciding that it is to its interest to remain an independent organization. A report of a special committee on a possible consolidation with a view of effecting economy in the operation of the Institute was made by Secretary Corse. He said that the executive committee felt that while the two organizations have much in common, there are some members of the Institute, such as men in rolling mills and refining plants, who are not interested in foundry problems and that it would be unwise to bring about the merger. The Institute should be a place for a practical brass foundryman as well as for the metallurgist, and he felt that the metallurgical side of the brass foundry is more important than that of the iron foundry because the brass foundry has to do with fifty metals while the iron foundry has only the one metal. The growing value of the Institute was shown by the presentation of more valuable papers and he said the executive committee wished to avoid any danger that might result from a consolidation. George C. Stone, who acted as chairman during this session, said the executive committee was unanimous in its decision to have the Institute remain as an independent organization. R. R. Clarke observed that the sessions this year more than ever showed that the Institute is bringing the practical and technical men together and that they are co-operating more closely. C. P. Karr suggested that efforts be made to get more of the prominent metallurgists, including college professors, to join the Institute and prepare papers. Mr. Corse replied that frequently papers were secured from prominent metallurgists who are not members.

The action of the executive committee in favor of remaining a separate body was formally approved.

Secretary Corse announced that Dr. Burgess had suggested that the Bureau of Standards act as a clearing house for information regarding the properties of alloys and had requested the Institute to aid in collecting this information. In connection with this he said that the advisory committee would hold a meeting in Washington this fall, probably in October. The members were told that if they can furnish information regarding some of the properties of alloys, the Bureau of Standards, with the instruments at its disposal, can

provide the remainder. Mr. Karr stated that hydrostatic tests are of as much importance as others, the hydrostatic pressure being of particular interest to makers of plumbing fixtures, and that these tests should be made. P. E. McKinney thought steps should be taken to standardize hydrostatic tests, there being nothing at present on which to base these tests. It is decided that this is a subject that should be handled by the American Society for Testing Materials and the secretary was instructed to communicate with that society with a request that it formulate the hydrostatic standards.

At the opening session Wednesday, Secretary Corse reported that the Institute had 300 members July 1 as compared with 314 on the same date a year ago, but that there is now a gain in membership, owing to the fact that 35 to 40 new members have been taken in since July 1. Attention was called to the fact that the committee of the Institute holds a meeting twice a year with the U. S. Bureau of Standards. W. H. Bassett of the American Brass Company, chairman of the committee to standardize sizes of crucibles, submitted a report containing a list of standard sizes which was accepted. Dr. Burgess of the Bureau of Standards called attention to the need of greater support of the Bureau's work. He said a great deal of new research work was to be taken up speedily, but the required staff and facilities were lacking, although an appropriation of $50,000 made by Congress would help a great deal.

BRASS FOUNDRY OPERATIONS

The subject of the first paper Wednesday was "The Brass Foundry," this being presented by E. A. Barnes, Fort Wayne Electric Company, Fort Wayne, Ind. In this the facilities for molders in the brass foundry as it existed 30 years ago were compared with those of the present day. At that time there were only two choices of fuel—coal and hard coke—while to-day gas, fuel oil and electricity are also available for melting purposes. The present-day brass foundry would not be up-to-date unless it had compressed air for use in blowing off patterns and operating molding and jarring machines and squeezers. Even the individual workbench of the modern brass foundry is equipped with an air nozzle and rapping hammer, enabling the workman to get along without the assistance of his neighbor except in special cases. In spite of the use of improved power-operating molding machines he felt that only a start has been made in introducing modern labor-saving machines in the foundry. He said that the value of an efficiency engineer and chemist to a brass foundry is now unquestioned.

One of the problems that has been solved by the brass foundry with which he is connected (which was referred to in the paper), was the producing commercially of large quantities of a duplex thermostatic metal. It was necessary to cast or otherwise fuse together a brass alloy and a plate of nickel steel, providing the alloy would stand rolling down to .003 in. thick or less, the finished duplex sheet to be exactly 50 per cent brass and 50 per cent nickel steel. In order to secure the required results it is necessary to have control of the casting of the yellow brass, which meant the necessity of pure copper. Many experiments were tried, but either the brass cracked into small pieces or became detached from the steel plates. An alloy was finally developed having the proper characteristics. Samples of the duplex thermostatic metal were shown.

Schoop Coating for Patterns

The paper referred to the question when it is best to make use of metal patterns for repeat work. The writer's experience was that it was best to make a first-class wooden pattern and use it as long as possible, as changes are frequently made after the first castings have been put in use and wooden patterns can usually be changed more readily than a metal pattern. His shop has been on the lookout for some method of increasing the life of wooden patterns and has been experimenting with the Schoop metal coating process for applying a copper or lead coating to fragile and complicated wood patterns, the metal coating being designed to render the patterns waterproof and stiffen them so they will hold their shape and wear better. This process has not been used in the shop long enough to be pronounced an absolute success, but some of the patterns plated by means of the process have given surprisingly satisfactory results.

Another problem solved in the shop was the making of an aluminum casting that would take a high polish. All the standard alloys were tried, but the castings invariably were full of small black specks due to gas in the metal. A satisfactory casting was finally produced by adding 8 to 10 per cent of tin to the alloy. The paper referred to the development of the pressed metal process for producing brass and aluminum parts more homogeneous, tough and perfect than can be made by ordinary casting methods. In this process a blank of copper or aluminum bar of sufficient size to contain the amount of metal required in the finished part is heated to a fairly high temperature and this hot blank of metal is forced into a steel mold corresponding to the desired metal part. By means of a hydraulic press, a high pressure is exerted to force the metal into the mold. The results obtained by this process of forming the brass and aluminum parts were declared to be remarkable. In regard to further progress in foundry methods the speaker said:

> I feel that it is to the melting end of the foundry itself that we must look for the greatest advances in the near future. I believe that all of the present methods of melting will soon be replaced by much more efficient processes, either electrically or by burning a gas derived from a fuel oil and mixing with air which produces the nebulous form of gas now used. The advances that have been made in electrical furnaces, ovens and retorts lead me to expect that in the near future electricity will compete on favorable terms with the various fuels for foundry melting purposes. I believe there is no doubt that some of the great electrical men are investigating along these lines and the results of their research should be disclosed in the near future.

Various subjects referred to in the papers were brought up in the discussion, particularly the Schoop metal coating process. The opinion was expressed that it will be necessary to keep the Schoop equipment in operation 24 hours a day to make it economical, because of the rental charge for the equipment. President Jones referred to a process that is successfully used for welding copper and aluminum, but stated it is available only for small wire.

PROGRESS IN DIE CASTING

In an interesting paper on the "Evolution of the Die Casting Process," Charles Pack, Doehler Die Casting Company, Rochester, N. Y., discussed the metal casting art from early historic time down to the present. He illustrated his paper with a large number of lantern slides, starting with a picture from a wall painting in an Egyptian tomb dated 1500 B. C., indicating that the Egyptians alloyed their metals and poured them into ingot molds, the furnace consisting merely of a hole dug in the ground to hold the crucible and fuel. Other pictures showed the development of the metal casting industry during more recent times. He stated that casting in sand as a commercial method began about 1708 and that the metal mold resulted from the demand for a cheaper method of producing type after the advent of printing. Although die casting as an industry dates back not over 25 years some of the fundamental principles were practiced as far back as the 15th century. During the first half of the nineteenth century many casting machines were patented using the plunger type casting principle but varying in design. The first application of this principle to the manufacture of die castings, as understood today, appears in a patent issued in 1827 for a plunger type machine for casting babbitt bearings. Machines of this type with varying designs were used for casting tin and lead alloys on a small scale but die castings did not receive recognition as a standard metallurgical product until 1907 when the Doehler machine was patented. Referring to the use of die castings the paper contained the following:

> These castings have found many uses, among which may be mentioned the following:

1. For housings on magnetos.

2. Tone arm, elbow and sound box for talking machines.

3. Automobile oil pumps, wing nuts, horn, speedometer and many other parts of motor vehicles where high tensile strength is not essential.

4. Automatic vending machines—internal and external parts of gum, cup, stamp and cigar vending machines.

5. Electrical devices, such as oscillating fans and signaling devices.

The zinc alloy die casting showed such a great saving of time and labor over the rough sand casting that many manufacturers, without entering into a thorough study of the merits of this product, literally fell over each other in their mad scramble to use zinc die castings in the place of brass, aluminum and iron castings in sand. The natural result of this situation was that die-casting plants began to spring up in unlimited numbers, many of them being owned and managed by men entirely unfamiliar with the metallurgical principles involved. Under these conditions it is not surprising that zinc die castings were used for many purposes where their low tensile strength, or corrosive properties should have prevented their use. The result of this was that some manufacturers became prejudiced against the use of zinc die castings.

The reliable die-casting manufacturers then set to work improving their process and alloys. The enormous demand for aluminum and brass die castings was partially met by the introduction of aluminum die castings made by the Doehler process. These die castings made from the standard No. 12 aluminum-copper alloy have now been on the market for three years. The castings have been found eminently satisfactory as evidenced by their use on 75 per cent of the better grade motor cars.

The aluminum department of our company using the Doehler process is now producing a larger number of castings than the zinc department, showing the enormous demand for this product. That aluminum die-castings are not used to even a larger extent must be attributed to the fact that the present war has given one company in this country entire control of the aluminum supply.

DISPOSAL OF OLD METAL

"How a Large Manufacturing Concern Disposes of Its Old Metal" was told in a paper presented by J. M. Bateman, Western Electric Company, Cleveland, and read by title. The paper described briefly the methods employed at the Hawthorne works of the Western Electric Company for reclaiming its waste metal. Waste sheets of brass, copper, German silver, etc., from which parts are punched, are separated according to material and compressed in an electrically operated Minich baling press into bales approximately 2 x 2½ x 3 ft., weighing about 1100 lb. In addition a Logemann hydraulic bundling press is used which makes bales only about one-tenth as large as those made in the Minich press. For separating the dust and dirt from the small chips and metal shavings from the machine department a mechanical separator is used, consisting of a sifter oscillated by a small motor. In addition there is a magnetic separator for separating the iron from the brass in the small parts. This consists of a revolving drum with an annealed iron face and within the drum is fastened a series of electro magnets. The metal is separated by passing through this drum and the chips are placed in sacks for convenience in handling. Junked cable is reclaimed by being placed in a gas heated brick enclosed oven where it is heated until the lead sheath has been melted and the paper insulation has been burned from the wire. The molten lead is run into a refining furnace and poured off into molds. The copper wire left in the furnace is compressed into brick form.

"The Reclamation of Brass Ashes" was the subject of a paper by Arthur F. Taggert, Hammond Laboratory, Yale University, that was read by title. In discussing this subject Mr. Corse said that his company is using a Hill crusher or mill, the tailings being run from the crusher to a concentrating table. This crusher has been made into a constant instead of an intermittent mill so that it does not have to be shut down to take the concentrates out and good results are being obtained by operating it in this way. A small hand ladle is used for dipping in the barrel to take out material and put it on the concentrating table. Large pieces are separated by means of a ¼-in. screen so that these do not pass to the concentrating table.

BRASS CASTINGS WITH THIN WALLS

"The Making of Thin Walled Castings" was the title of a paper by R. S. B. Wallace, National Cash Register Company, Dayton, Ohio. The paper stated that excellent results are being obtained in making thin walled ornamental castings of large area in brass and bronze by using the same method as is used in making such work in iron. This paper described the method used in the brass foundry in making ornamental castings for the outside case of a cash register. The preparation of sand requires a great deal of attention. The molds are poured in cast iron flasks with machined joints. When possible molds are made on molding machines and a pattern plate is used. Metal is melted in coke fired pit furnaces and is poured very hot. In reply to a question Mr. Wallace stated that suitable pyrometers are not available so that the melter uses his eye to determine the proper temperature of the metal.

The session closed with a paper on "Alloys to Withstand Internal Air Pressure," by S. D. Sleeth, Westinghouse Air Brake Company, Wilmerding, Pa.

THE BURNING-IN PROCESS

At the opening of the Thursday session C. P. Karr of the Bureau of Standards presented a report on a series of comparative tests of zinc and bronze. A paper on the "Deterioration of Muntz Metal," by Dr. H. S. Rawdon, United States Bureau of Standards, was scheduled but was not presented, the paper not having been completed. A joint paper on "The Initial Stress Produced by the Burning-In of Manganese Bronze," prepared by Paul D. Merica and C. P. Karr of the Bureau of Standards, was read by Dr. Merica. The paper referred to an investigation made in connection with the failure of a number of manganese valve castings in the Catskill Aqueduct. Large castings of this material, after several months' service, developed fissures through which leakage took place under only a few pounds of pressure. As a result of the local heating of welding and consequent unequal contraction of different constrained parts of the castings, the stresses remained, being particularly severe near and within the burned-in areas, this probably being responsible for subsequent failure at these points. The conclusion drawn from the experiments is that the burning-in of constrained portions of manganese bronze castings produces in general local initial tensional stresses within and near the burned-in zone, of value equal to the true elastic limit of the material, unless the shape of the casting is such that extensive distortion may occur, and that such castings should, therefore, be either pre-heated carefully for welding so that all parts of the castings cool down together or that the castings should be subsequently annealed.

Jesse L. Jones stated that he had used the burning-in process for collector rings and tests showed that the process was successful. In the discussion following the presentation of the paper the statement was brought out that the failure of the burning-in of either ferrous or non-ferrous metal was due to the fact that the severe stress set up by the hot metal striking the cold metal and by the shrinking of the hot metal has either been ignored or not given proper attention.

INSPECTION OF BRONZE AND BRASS

A very interestng paper under the caption "Notes on the Inspection of Bronze and Brass," prepared by Ernest Jonson, engineer inspector of the New York Board of Water Supply, was read by Secretary W. M. Corse. A brief resume of this paper follows:

Brass and bronze castings are subject to various defects which are difficult to discover by surface inspection or even by hydrostatic testing, when such a test is practicable. The defect which most commonly occurs results from the inclusion of oxide in the casting. This occurs in two ways: Either the molten metal contains an admixture of oxide, owing to insufficient protection of the molten metal from the air, or the dross from the surface of the crucible or furnace charge gets into the mold and is caught at some point where the flow is slight, and is thus prevented from coming to the surface in the risers. In the former case the entire casting

is bad and the best way to discover this defect is to make tensile tests on specimens cut from a coupon cast from the same melt. The admixture of oxide is indicated by the greatly reduced elongation and by the low ultimate strength. The tensile tests should, therefore, be specified for all important brass and bronze castings, no matter whether a certain strength and elongation are of mechanical value or not. If a tensile test is impractical, oxidation may be discovered by making a bending test on a machined specimen. A number of small cracks on the outside of the bend would indicate the presence of oxide.

The writer's experience indicates that oxidation of metal in the crucible is a very common defect, especially of the mixtures of high percentage of copper, that is of the bronzes. It is his belief that in foundries where textile or hydrostatic tests are not made the metal is generally allowed to become oxidized in the crucible because this defect does not show on the surface of the casting. To specify bronze castings merely by the mixture is therefore useless. A bronze casting may be made of the correct mixture and may show no surface indication of defects, and still may be nothing but a honeycomb of metal, the cells of which are filled with oxide. The presence of included dross is more difficult to discover. If a hydrostatic test cannot be made, it is practically impossible to find such defects unless they happen to come to the surface of the casting and even a hydrostatic test does not always reveal such defects. The best assurance against this kind of defects is correct molding. The molding of a casting should be planned while the casting is being designed. Whenever practical castings should be poured from the bottom. In determining the position of the casting in the mold, extensive flat upper surfaces should be avoided as dross may accumulate by being caught under the flat surfaces of the mold or core.

Another source of trouble is insufficient risers. The number of risers should not be left to the foundryman, who may be prejudiced by considerations of economy in favor of fewer and smaller risers than are needed for high quality work. Brass and bronze castings should not be rejected because of defects which can be remedied. The minor leaks in hydraulic castings may be stopped by peening. It is the common belief that certain brass and bronze mixtures are normally porous and permit water to pass through them under a high pressure. This belief, however, is erroneous, at least up to a pressure of 1000 lb. per sq. in. If water comes through a casting at less pressure it is an indication that the metal is not clean or that the casting is porous. Peening is a questionable method of treating defective spots in brass or bronze castings. If the defect is small a hole may be drilled and a plug of the same metal may be screwed in. If plugging is not practical defective spots should be cut out and the cavity filled with new metal. In welding defective spots in castings, except in those of certain specified dimensions, shrinkage stress must be prevented by keeping the casting heated to a high temperature while the weld is being made and until it has solidified. Another way to prevent cracking is to anneal the casting immediately after the weld has been made. Annealing is also used to some extent to eliminate initial stress by lowering the elastic limit. A source of defect in brass work lies in the heat treatment by workmen unfamiliar with the properties of brass, who accustomed to do such work on iron and steel are liable to ruin the brass by overheating.

The discussion of this paper called out expressions as to whether the gating of a mold should be at the bottom or the top. E. A. Barnes, Fort Wayne Electric Company, told of the method finally adopted in his shop for the pouring of hemispheric bell-shaped ice machine castings. First these were poured from a crucible and many of the castings were imperfect. Then the drop-pouring method was adopted and now 98 per cent of the castings are perfect. R. R. Clarke, Pennsylvania Lines West, Pittsburgh, declared that drop-pouring was not economical and said that in their shop they were pouring many kinds of molds with gates at the bottom. While many foundrymen were prejudiced against bottom gating he thought they would see that this method was right if they went into the matter further.

WELDING REPAIRS TO NON-FERROUS CASTINGS

S. W. Miller, Rochester Welding Company, Rochester, N. Y., gave a talk on "The Application of the Oxy-acetylene Welding Process in the Repair of Defective Non-Ferrous Castings." He said that brass and bronze alloys cannot be welded with the same alloy and that it required many tests to find the proper welding material. He had welded pieces ½ x ¾ in. in size and they had been bent over cold after they had been ground down to size. The appearance of this welding shows clean, satisfactory work, but the subject will be known better, he added, after more complete tests have been made.

In welding valve bodies, the first castings on which this work was attempted were badly distorted because of the heat, but these distortions are now very slight and do not impair the castings. A satisfactory welding material must readily unite and be applicable to any quality of brass or bronze. He did not think it possible to weld Admiralty or gun metal. Any material having tin in it will not do for welding purposes. Welding material must have a deoxodizer, but zinc will not answer. Many castings can be reclaimed in a brass foundry, and he believes the oxy-acetylene process properly applied will be a great advantage, especially in times when large production is desired. In welding manganese bronze a very small amount of aluminum must be used in the welding material. Pure copper can be welded satisfactorily and practically free from blow holes by using a copper and phosphorous welding material.

A paper on "A Curious Case of Corrosion of Tinned Sheet Copper" was presented with lantern slides by Dr. Paul D. Merica. The case referred to was that of the Library of Congress in Washington, which is covered with tinned sheet copper material installed about 1894. Furrows or pits have appeared on the surface of this roof.

Dr. H. S. Rawdon, United States Bureau of Standards, was not present and his paper, entitled "Notes on the Occurrence and Significance of Twinned Crystals in Electrolytic Copper," was read by title.

A paper on "The Annealing Properties of Copper," by G. V. Ceasar and G. C. Gerner, Hammond Laboratory, Yale University, was presented but not read or discussed.

COPPER-ALUMINUM-IRON ALLOYS

The first technical paper Friday was entitled "Some Copper-Aluminum-Iron Alloys," prepared by W. M. Corse and G. F. Comstock and presented by the former. This paper gave some of the preliminary results obtained in the examination of these alloys, and without reading the paper Mr. Corse referred to some of the results of the investigation. He said it is possible to add iron to aluminum and copper alloys, thus increasing the tensile strength and particularly the yield point. The addition of the third metal to the binary alloy helps to break up the large crystalline structure which characterizes the binary alloys and to improve the physical qualities of the combination.

The paper includes a table which shows that for the same aluminum content there is always an increase of proportional limit, yield point and tensile strength with increasing iron content, and in general a rather less substantial degree in elongation and reduction of area. In the same way, with constant iron content, the proportional limit, yield point, and tensile strength increase with increasing aluminum, while the elongation and reduction of area decrease. Other tabulated tests indicate that the proportional limits and yield points increase fairly regularly with the iron content; the ultimate strengths do not change much after 4 per cent iron, and the ductility drops decidedly. The best alloys, considering both strength and ductility, appear to be those containing between 3 and 4 per cent iron.

"Physical Test of Common High Brass Taken Parallel and at Right Angles to the Direction of Rolling" was the title of a paper illustrated with lantern slides, prepared by William B. Price and Philip Davidson, Scovill Mfg. Company, Waterbury, Conn., and read by Mr. Price. This paper referred to the investigation of the physical properties of cold rolled brass tested longitudinally and transversally, this test referring particularly to specifications in the manufacture of brass shrapnel casings.

MANGANESE FOR HARDENING ALUMINUM CASTINGS

"Aluminum Castings and Forgings" was the title of an interesting paper by P. E. McKinney, United States Navy Yard, Washington. He said that in the manufacture of light castings, the properties that may

be decided as most desirable are low specific gravity, a fair amount of strength and freedom from brittleness, good machining properties, the maximum resistance from corrosion and good casting qualities and freedom from hot shortness. Pure aluminum is entirely too soft to produce satisfactory castings for most purposes, and it is the universal practice to stiffen up the alloy with some hardening element, copper being the most widely used hardener. Various combinations containing manganese with or without copper and with a minimum aluminum content of 95 per cent have been used in foundry practice for the past two years with gratifying results, the use of manganese in relative small quantities hardening the alloy without destroying its ductility as in the case of copper or zinc. Special furnaces are not required in the production of aluminum containing manganese, which can be melted in natural draft pit furnaces. The paper, in part, was as follows:

PROCEDURE IN MELTING ALUMINUM ALLOYS

In melting aluminum alloys, clay crucibles or clay-lined crucibles are preferable. No charcoal or carbonaceous covering is used on the metal, as carbon combines with this alloy, forming a very brittle compound. Gates and sprues from castings must be carefully cleaned and freed from sand, as practically all the sand introduced into the pot is reduced to silicon which materially weakens the alloy. In cases where there is danger of introducing sand into the crucible it has been found very beneficial to introduce a powdered flux which is made by melting together 60 per cent of potassium chloride and 40 per cent of kryolite and powdering the mixture. This flux tends to dissolve the silica and keeps it from combining with the aluminum.

In preparing the alloy for casting purposes an empty crucible is set in the furnace and heated to a bright red heat. The requisite amount of hardening alloy is added and melted as quickly as possible. As soon as the hardener is melted the draft is cut down by opening the cover of the furnace and aluminum is added in small increments as fast as it will melt, timing the additions so as to keep to temperature of the mixture at not more than a faint red heat. The crucible is drawn from the furnace just before the last of the aluminum is melted in order to prevent the metal becoming overheated. This is a very important point, as overheated aluminum will absorb silica from the walls of the crucible at a very rapid rate, and it has been found that once overheated this aluminum is practically worthless for future use. Just before pouring there is added to the contents of the crucible about ¼ oz. of zinc chloride and the metal is thoroughly stirred with a clay-covered skimmer. This zinc salt tends to reduce the oxides and dross in the metal and puts it in ideal condition for casting purposes. Alloys of aluminum containing manganese have a slightly greater shrinkage than those containing copper alone, and due allowance must be made by using ample risers and chill plates on intricate castings.

The paper stated that alloys of aluminum containing manganese have been found to work very freely in cold rolling or hot forging. The same type of ingot molds are used in preparing aluminum for forgings as for brass forging ingots. In making drop forgings from aluminum a little preliminary forging is desirable. The ingot can be cut or dropped and forged to approximate shape at a temperature from 1150 to 1200 deg. Fahr., after which they can be finished in the dies.

In reply to questions, Mr. McKinney stated that it is preferable to use steel crucibles for aluminum alloy, if they are to be had. Difficulties due to sluggishness in the metal is overcome by the use of fluxes. The statement was made that nichrome crucibles were all right with brass but went to pieces with aluminum. Mr. McKinney said that the use of iron crucibles is more or less a questionable practice, but that wrought iron crucibles are more satisfactory than those made of cast iron The statement was also brought out that the physical properties in cast aluminum and alloys are improved particularly in automobile castings by the use of up to 1 per cent of iron.

CRACKING OF CARTRIDGE CASES

A paper on "Seasoning Cracks and the Self-Annealing of Brass," by W. Arthur, Frankford Arsenal, Philadelphia, brought out considerable discussion of this subject, particularly in reference to the cracking of artillery and cartridge cases. Cadmium was stated to be a contributing cause. Mr. Arthur said that some other alloy might eventually have to be used for cartridge cases because of the seasoning cracks and that copper-aluminum alloy might be desirable. He said the British government was having the same trouble that this country is with its cartridge cases.

In connection with a paper on "Co-operation with the Metal Industries in Metallographic Work," by C. H. Mathewson, director Hammond Laboratory, Yale University, which was read by title, W. B. Price spoke in high praise of the work of the Hammond Laboratory. The closing paper on "Electrolytic Refining of Copper," prepared by F. L. Antisell, Raritan Copper Works, Perth Amboy, N. J., was read by Mr. Corse and described the electrolytic copper refining process.

Federal Motor Truck Business Expansion

The Federal Motor Truck Company, Detroit, held a most successful sales conference at Cedar Point, Ohio, last week. It was attended by 150 district managers and dealers from every State in the Union. They assembled in Detroit on Wednesday where they took a steamer, chartered for the purpose, to Cedar Point, arriving about 6 p.m. Addresses and discussions by executives and salesmen occupied the morning and afternoon business sessions, held in the large convention hall. Traffic research, sales promotion and advertising were the principal topics. New 1917 models of Federals were on display and were the center of interest, after their arrival on Friday. For one of the new models alone, the dealers placed definite orders with the director of sales, J. F. Bowman, amounting to over $1,000,000.

A banquet on Friday evening was the closing feature of the conference. Chief Pitt, of the fire department of Middletown, Conn., came from New England to tell the Federal dealers how a Federal truck had saved his city $1,800 per year. Another speaker was E. St. Elmo Lewis, who told the dealers that the best salesmen were the men who could dominate the situation with a prospect. He said, "You have got to know enough about the business of a store or firm to get the authority to tell how to apply your product, motor trucks, to its problem."

M. L. Pulcher, vice-president and general manager of the Federal Motor Truck Company, conducted the convention, and in one of his talks to the men said: "The company is just concluding the most successful year in its history. Production has jumped away beyond our estimates and sales have kept pace with the production. New buildings have been necessary, until the Federal company now occupies acres where five years ago the space was feet. Further expansion is necessary, and new buildings will be started in the spring to take care of the increased output which will be speeded up to fill the orders which you have placed."

Edward LeBas & Co., Beaver Building, 82-92 Beaver Street, New York, are supplying the trade with "Proctor's Useful Tables," which are of special value to those who are transacting foreign business and are quoted ocean freights in shillings. The tables are designed to save time in figuring the conversion from shillings per gross ton to cents per 100 lb. Copies of these tables are furnished at the nominal price of 2c. each, or 10c. per dozen.

The New York office of the Munning-Loeb Company, Matawan, N. J., manufacturer of electroplating and buffing apparatus and supplies, has been removed from 417 Canal Street to the Taylor Building, 39 Cortlandt Street. G. C. Backus is in charge.

All-Geared Head for Foster Screw Machine

BY OSKAR KYLIN

The all-geared head shown in the accompanying illustrations has just been designed and tested out, and is about to be put on the market by the Foster Machine Company, Elkhart, Ind. It is to meet the increasing demand for single pulley drive screw machines, a demand caused by the added advantages of instantly obtainable speed changes in the geared head machine, and the greatly increased pulling power, owing to the much higher belt speed that can be employed in this style of a head as compared with a back-geared cone head.

One interesting feature in regard to the design of the head is the unit principle of design employed, the geared head itself being a new unit made to fit the standard Foster No. 5 screw machine. The cone in the standard back-geared machine is substituted by a three-gear cluster mounted on a sleeve journaled on the spindle. This gear cluster is arranged to engage a triple sliding gear cluster mounted on a shaft directly above the spindle, and shown plainly in Fig 3. This shaft is journaled in bronze boxes carried by the main head casting. The method of operating the sliding gear cluster is visible in Fig. 4, the means of operating being a rod and hand lever, which means has proved to be rapid and convenient.

On this same shaft are mounted two friction gears with the cone type friction, arranged to engage either of these gears. The purpose of this friction is to stop, start and reverse the machine, one of the gears being engaged by the reversing idler, mounted beneath the main driving pinion seen in Fig. 3. The means of operating the reversing friction clutch is shown in Fig. 1, being the lower of the two horizontal levers.

For driving the geared-head machine, a belt of 2½-in. width on a 10-in. pulley is employed. The speed of the pulley is 900 r.p.m., giving a belt speed of 2350 ft. per min. A single belt under ordinary shop conditions, and figuring a very conservative value, can deliver 6.2 hp. to the machine. The reversing friction in the head is powerful enough to pull a still heavier load than this without slippage. This amount of power is, however, greatly in excess of the requirements of the machine, a 2-hp. motor being ample for the general run of work done. If the work should be of unusually heavy character, demanding more power, a 3-hp. motor can be used to advantage. Fig. 2 shows the machine arranged with a 2-hp. General Electric 1800 r.p.m. motor mounted on the leg. The high-belt speed employed makes it possible to use a high speed motor of small frame. Attention is called to the method of guarding the belt as well at the motor as on the machine.

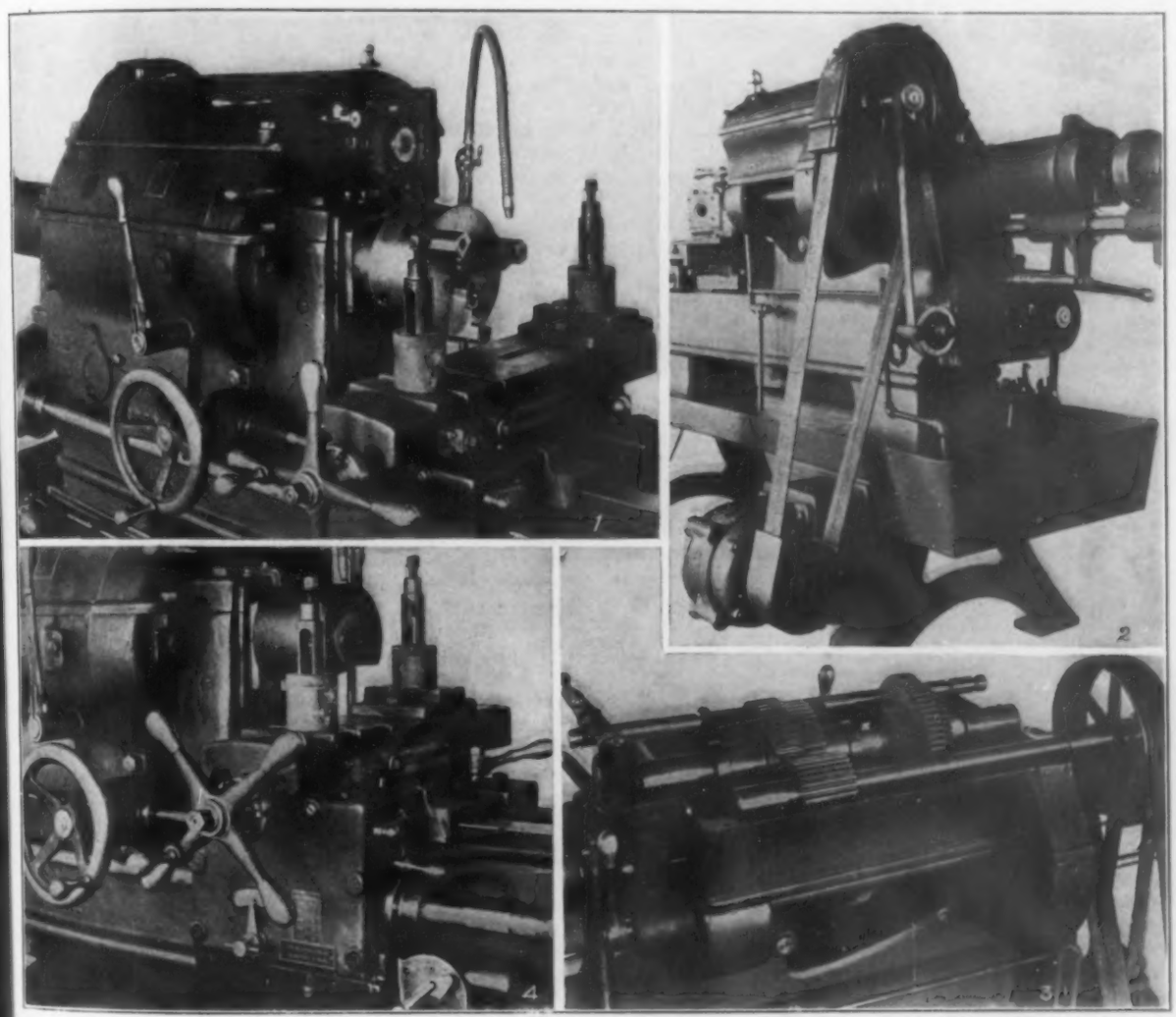

Fig. 1.—All-Geared Head for Foster No. 5 Screw Machine. Fig. 2.—Rear View of the Geared Head Arranged for Motor Drive. Fig. 3.—Arrangement of Gears in Head. Fig. 4.—Cross Slide Equipped with Hand Longitudinal and Power Cross Feed

Fig. 1 shows the machine equipped with a three-jaw geared scroll chuck clearing the cut-off slide. Fig. 4 shows the collet type automatic chuck, the capacity of which on the Foster No. 5 screw machine is 1 13/16 in. The diameter of the scroll chuck is 7½ in. and the swing over the cut-off 8¼ in. The cut-off slide and carriage is shown in Fig. 4, and is equipped with hand longitudinal and power cross feed with four feed changes.

The six speed changes are obtainable in the geared head and are in geometrical progression, ranging from 34 to 466 r.p.m. They are indicated, together with the corresponding movements of the levers, on the speed chart mounted on the head, and seen in Fig. 1.

Acid and Basic Steel for Castings*

A Discussion of the Inherent Differences—Acid Scrap on a Basic Bottom—German and American Output Compared

BY EDWIN F. CONE

CONSIDERATION of this subject is practically confined to open-hearth steel; and the question is not so much one of the acid as a competitor of the basic as it is one of comparison. About 85 per cent of the steel going into steel castings in this country is made in the open-hearth furnace. In 1915 the open-hearth output was 84.9 per cent of the total; in 1914 it was 87.1 per cent. Castings from the converter and the crucible are regarded as acid steels, while those made from the electric furnace are either acid or basic. But in the latter cases melting conditions are so different from those ruling in the open-hearth furnace that the steel can hardly be considered when discussing the open-hearth product.

USES OF ACID AND BASIC CASTINGS

There has been recognized for a long time a distinct dividing line between acid and basic steel castings. Castings which before being put to their final use are necessarily machined all over or to a large extent are almost universally specified and made of acid open-hearth steel. All other castings, principally bolsters, draw-bars, knuckles, etc., are poured from basic steel. This is the recognized practice.

The principal reason for this is not that one is inherently stronger than the other, but because acid steel, when properly made, is usually sounder and freer from defects. Hence it is less liable to reveal defects when machined and is therefore less subject to rejection. There is in fact only one distinct handicap which prevents basic steel from possessing a decided advantage over acid steel for casting purposes. When the basic steel has left the furnace and is covered with its slag in the ladle, a reaction at once starts between the steel and the slag consisting of a combination between the calcium of the slag and the silicon of the steel, by which silicon leaves the metal and goes into the slag and phosphorus leaves the slag and goes into the metal. The result is that the latter part of the heat is high in phosphorus and low in silicon—often low enough to cause the metal to be porous when cast.

In acid steel, of course, the conditions are largely the opposite. It is purely a melting and not a refining process, and if carefully carried out the steel is inevitably sounder. This is the main reason why it is specified for machined and jobbing castings in general.

In the steel foundry department of one of the largest steel plants in this country I was astonished to see a few years ago a 25-ton basic heat being poured for 45 minutes into small molds. It is hardly necessary to recount that toward the end of the heat the crop of "cauliflower" sink heads was a large one. It was then the custom in that plant to order from the open-hearth department a 0.25 per cent carbon heat for castings and the molding floor was sent any heat ready at the specified time, whether acid or basic. The losses were always large.

ATTEMPTS TO OVERCOME SLAG CONTAMINATION

To overcome a low silicon content in the last stages of a basic heat it is customary often to start with a high initial silicon, perhaps 0.40 to 0.45 per cent, especially where considerable time must elapse in pouring the heat. But even then, a basic slag being more highly oxidized than an acid slag, the metal at the end of the operation is more highly charged with oxygen, tending to less sound steel. The average basic heat will analyze lower in silicon at the end than at the beginning of the pour, often by 50 per cent.

Attempts to avoid this slag contamination of basic steel in the ladle have been many. Some have tried to remove the slag from the ladle and substitute an acid slag, but without gratifying success, so far as I know. Only one really effectual means of avoiding slag contamination has been accomplished. This consists in tapping a heat through one ladle into another, leaving the slag in the first ladle. By tapping the metal from the furnace into a ladle containing a nozzle and stopper about 6 inches in diameter, and then bottom-pouring the metal into a second ladle, all the slag can be retained in the first ladle. Such a method is claimed to be entirely effectual in overcoming the slag contamination, but to carry it out the steel must of course be run excessively hot in order to undergo this transfer and still be suitable to avoid misruns. In addition the metal is not benefited but rather injured by being made excessively hot. The furnaces also are injured more quickly and the fuel cost is higher, making the practice virtually prohibitive.

THE ADDITION OF FERROALLOYS

It can hardly be gainsaid that the best steel is made entirely in the furnace and not in the ladle. The acid process has a distinct advantage in that additions of ferromanganese and ferrosilicon can be made without difficulty directly to the metal in the bath, whereas in the basic practice this is not the case. Though many acid foundries add the manganese to the metal as it flows into the ladle, careful investigations show that the steel is better if these additions are made to the furnace, even though the consumption of manganese is greater.

The functions of the silicon and the manganese as purifiers, scavengers and strengtheners of the steel are more thoroughly and efficiently performed by the intimate mixing and contact secured by finishing the steel in the furnace. You can't make as good a loaf of bread by introducing part of the ingredients after the kneading.

THE QUESTION OF OXYGEN

To what extent oxygen in steel is harmful is not definitely decided. An authority stated recently that the results of extensive investigations warrant the conclusion that oxygen in steel, if it exceeds 0.01 per cent, tends to produce brittleness under shock. He gives the oxygen content of acid and basic open-hearth steels, as deduced from a large number of analyses as follows:

	Per Cent
Acid open-hearth steel	0.010
Basic open-hearth steel	0.019

The difference here cited is not a large one and it is just as easy to make a high oxygen acid heat as a poor basic heat if the furnace practice is not carefully watched.

Basic open-hearth steel, however, other things being equal, is of necessity the more highly oxidized one. In commercial steel castings this question is not likely an important one, as many basic castings are used successfully under conditions necessitating the withstanding of severe shocks. It is, however, a fact that more manganese is necessary as a neutralizer of this more highly oxidized condition than is the case in acid steel.

In electric steel castings, even from a basic bottom, the manganese consumption is decidedly lower than with the acid or basic open-hearth. This shows the healthy condition of the steel, especially as to its oxygen content. From one-third to one-half as much manganese is necessary in electric practice as in the open-hearth to achieve the same results.

*From a paper presented Sept. 15, 1916, at the American Foundrymen's Convention at Cleveland, Ohio. The author is on the editorial staff of THE IRON AGE, New York.

In normal times basic steel is considered less expensive to make because of cheaper pig iron and scrap. But these are more or less offset by the greater cost of the furnace lining and lime additions necessary. The result of the refining action of the basic furnace is a steel purer in respect to phosphorus and sulphur than is the acid steel. It is doubtful whether this alone is a particular advantage. Electric steel can be made so low in these two elements as to be considered by some a disadvantage.

Because selected materials must be used in making acid steel, many engineers have thought that a better grade of steel results. This is not a full statement of the case. It is the inherent conditions of the two processes that rule. Electric steel from the poorest scrap on a basic bottom can be made that is equal or superior to the finest crucible steel made from the most expensive selected stock.

COMPARATIVE PHYSICAL PROPERTIES

As to comparative physical properties, one of the largest makers of both acid and basic steel castings in the country gives it as his opinion that basic steel shows higher ductility for a given tensile strength than acid steel and as good an elastic ratio. I am unable to verify this statement from investigation. I have, however, seen some remarkable results from basic steel castings, superior to those from acid steel.

So many factors enter into this question that a very thorough investigation would be necessary to decide it. If basic is better, it is doubtless due to the fact that the refining conditions are an important factor. In the acid process old scrap is constantly remelted; the only virgin metal is the pig iron. In the basic, old scrap is refined in remelting and the proportion of pig iron or virgin metal is twice as great. These may be important factors.

BASIC CASTINGS FROM ACID SCRAP

A very interesting modification of the usual basic process for producing steel castings is being practised successfully by a large foundry in this country. The results obtained are interesting and striking. Acid quality scrap is used on a basic bottom. The only difference between the procedure at this foundry and at regular acid foundries is that they buy the same scrap that the acid producers use and a grade of pig iron similar in every way except its silicon content. The operation in other respects is the same as regular basic practice. Less lime by 50 per cent is used or necessary. The additions are made as in usual basic practice. The time for refining and hence for completion of a heat is less, as well as the wear on the furnace.

While the probable expense of this practice per ton of metal in the ladle may perhaps be more than for acid metal, though the opposite is claimed by the interested parties, it is asserted that the metal is better than either acid or regular basic and that the percentage of rejected castings is less by a considerable margin.

In favor of this argument is the fact that the absence of considerable refining, with consequently less chemical action, tends to produce a less oxidized metal resulting in one low in phosphorus or sulphur or containing less inherent wildness. Castings made by this procedure are continually competing with the same castings from acid foundries; they are reported as unusually sound and free from cracks and other defects. Locomotive frames, ship castings and machinery parts have been on the market from this foundry for five or six years now and are reported by users or inspectors as of the highest grade. It is claimed that the theory that basic steel is not suitable for the castings commonly made in acid has been exploded. It is at least a fact that here is a case where miscellaneous jobbing castings of all sizes, from very small to large ones, are made in basic steel and with excellent commercial results.

GERMAN AND AMERICAN STEEL CASTINGS

It is interesting to compare the relative open-hearth steel casting output of this country and the casting output of Germany. The following table gives parallel figures of the percentage of acid steel castings in the total steel foundry output of the two countries for the last 15 years:

	United States		Germany	
Years	Acid Open-Hearth Castings, Per Cent of Total	Total Open-Hearth Castings, Gross Tons	Acid Castings, Per Cent of Total	Total Castings, Metric Tons
1901.....	68.4	301,622	37.0	107,210
1902.....	69.6	367,879	40.0	116,524
1903.....	66.3	400,348	34.3	131,756
1904.....	67.5	302,834	30.3	152,814
1905.....	60.9	526,540	35.1	186,131
1906.....	56.5	719,891	41.0	189,313
1907.....	50.9	746,525	40.4	211,498
1908.....	50.4	311,777	40.1	192,883
1909.....	49.0	601,040	40.3	206,456
1910.....	49.7	863,351	42.5	262,811
1911.....	53.3	571,191	37.9	269,372
1912.....	49.0	870,848	31.1	321,663
1913.....	49.4	910,216	30.1	362,916
1914.....	44.7	604,317	29.1	298,338
1915.....	54.7	735,332	27.8	694,515

In this country there has been a gradually decreasing proportion of acid castings since 1901, with the exception of the years 1911 and 1915. In Germany the basic predominates and is surprisingly larger than in the United States. This is especially true in the last two years under war conditions, though as a general rule Germany's use of basic castings is more extensive than ours. Since 1906 the falling off in the proportion of acid castings there has been quite pronounced.

Speculation as to the cause of this difference in conditions in the two countries is not likely to be profitable. We have often heard it said that German efficiency has produced better castings than American practice, be it acid or basic steel. It is probable that the general use to which they are put is not greatly different in the two countries. If this is so, the Germans must possess some method by which their basic castings are more acceptable than ours or else American foundrymen have too little faith in the metal they make. Is the desire in this country for tonnage rather than quality the answer? Or do the Germans produce a large proportion of their castings from acid scrap on a basic bottom?

THE GAIN IN BASIC

The gain of the basic on the acid castings has been pronounced in both countries. There is no reason why the basic should not continue to gain. With rapid advances in metallurgical practice it is not unlikely that a way will be found whereby basic may become equally interchangeable with acid for steel castings. To what extent electric steel castings may affect this question is important. As bearing on this, it is interesting to note that of the total steel casting output of the United States in 1909, only 0.05 per cent was electric steel. In 1915, electric steel castings comprised 2.6 per cent of the total and the output has only begun to grow.

American Steel and Machinery for Sweden

Ivar Alfsen, who has been in the United States for the past 10 years, for a good portion of that time connected with the American Woodworking Machinery Company, Rochester, N. Y., as export manager, has become manager of the machinery department of H. Schiander's successor, at Moss, Norway. The firm is engaged in the machinery import trade for Norway, Sweden, Denmark and Finland, and is arranging to establish connections with American manufacturers in iron and steel, metal working and other machinery lines, particularly connections in structural steel, wrought and cast iron pipe, tin plates, rails and machinery for shipyards.

The Fourth Annual Efficiency and Welfare Conference under the auspices of the Pennsylvania State Department of Labor and Industry and the Engineers' Society of Pennsylvania will be held at the Capitol, Harrisburg, Nov. 21, 22 and 23. Representatives from practically all the larger iron and steel plants and other industries in the State and many engineers will be present. Among the topics for discussion will be new industrial legislation, accident prevention, occupational diseases, problems of employment and unemployment, avoidance and settlement of labor disputes, Americanization of alien workers, fire prevention and other manufacturing problems.

Machinery Markets and News of the Works

NO HALT IN ACTIVITY

Western Tool Builders Enlarging Plants

British Order Causes Fear of Further Restrictions on Shipments to Neutral European Countries

Purely domestic industrial demand for machine tools is active and the future looks good. Deliveries of standard tools are being pushed further off, but buyers do not hesitate to place orders even when it is made clear that several months must elapse before they can get desired machines. The buying is scattered, tools of all kinds and sizes being sought to balance equipments.

Dealers who have shipped extensively to Holland, Sweden, Norway and Denmark are apprehensive over a ruling of Great Britain to the effect that the Netherlands Oversea Trust will not be permitted to receive shipments from America, while letters of assurance will not be granted for American shipments to the other countries named. It is too early to say what the results will be. Usually the restrictions have not been so severe as appeared on their face.

The steel mills have been large buyers in Cincinnati, and the automobile makers have been a little more active. Despite high building costs tool builders are enlarging their facilities. Extensions are under way for the following: American Tool Works Company, R. K. Le Blond Machine Tool Company, and the Cincinnati Milling Machine Company.

Milwaukee tool builders are running behind on deliveries because of the insistent domestic demand. In that city also plant extensions are numerous. Kearney & Trecker have enlarged their facilities.

The demand for standard machines is brisk in Detroit, although it requires from four to seven months to fill orders. Housing labor is a great problem in that city, it being reported that many workmen are going to other places because of the high rents they are obliged to pay.

The Pacific Northwest continues to suffer from a shortage of freight cars. Overflow work from the shipyards is giving smaller shops plenty to do. The Alaskan trade shows a steady growth.

Trade in Canada is far above previous records, and exports of manufactured goods are in excess of imports. Hot weather in August reduced the production of shells.

New York

NEW YORK, Sept. 20, 1916.

Scattered buying of all kinds and sizes of machine tools indicates a healthy condition in the metal-working industries. No large lists are out, and the tools being bought are those required to balance production equipment. The demand has tightened up deliveries in many directions, but buyers who are informed that they cannot have machines before December or January do not refrain from placing their orders.

The many inquiries are being followed up in an energetic manner, such as is usual in normal times. In the great war flurry many salesmen were called in from the road, while others traveled merely to appease their trade, for the reason that orders poured in without much exertion on their part.

Dealers have lately done a good business in lathes for export. Some who have been shipping to Holland, the machines being consigned to the Netherlands Oversea Trust, are wondering to what extent their business with that country will be curtailed by an announcement cabled Sept. 15 that the British Government will refuse to allow the Holland combination to accept further shipments from America.

The cable further announced that Great Britain would decline to grant letters of assurance for American shipments to Holland, Sweden, Denmark and Norway. British exporters are stated to be under the ban also. This means that shipments are likely to land in the British prize court, and it is believed to be questionable whether steamship companies will take the risk of accepting goods destined for the countries in question. Two reasons are advanced for the new restrictions, the first being a desire on the part of Great Britain to control supplies at the source, and the second that the British Government has found the detention of suspected ships to be exceedingly expensive because of the resultant claims for damages.

Several interests have cabled for details of the new prohibition and until these are received it is too early to say just how business will be affected. Several dealers have machines in their warerooms already boxed and marked for shipment to the Netherlands Oversea Trust.

The Russians are buying occasionally, and some French inquiries are before the trade.

H. M. Albee & Son, 35 Halsey Street, Newark, N. J., machinists, are erecting a one-story reinforced concrete factory, 48 ft. square, on a plot 48 x 100 ft., and will devote it to the manufacture of special machine parts.

The Lovell-McConnell Mfg. Company, 190 Wright Street, Newark, N. J., manufacturer of automobile and marine electrical appliances, warning signals, etc., has been acquired by the United Motors Company, and its name has been changed to the Klaxon Company. D. A. McConnell, formerly vice-president, becomes president and general manager; and W. P. Coghlan, formerly secretary, becomes secretary and treasurer. F. Hallett Lovell, Jr., former president, retires from the company.

The Mignon Wireless Corporation, Elmira, N. Y., manufacturer of radio apparatus, has increased its working capital from $10,000 to $25,000. Ernest C. Mignon is president.

The Sintered Ore Company, Buffalo, is building a fan room addition to its plant at the foot of Hamburg Street and the Buffalo River.

The Atterbury Motor Car Company, Buffalo, is repairing fire damage to its plant, Elmwood and Hertel avenues, at a cost of $20,000.

The Donner Steel Company, Buffalo, has recently taken out building permits for its new bar mill, an addition to the blooming mill, a forge and axle building and a shipping building. Work on these structures is being rushed.

The plant of the Delaney Forge & Iron Company, Perry Street and the Lehigh Valley Railroad, Buffalo, was swept by fire on the night of Sept. 15 with a loss of $200,000. The principal loss was in the forge building and machine shop and the power plant, recently equipped with up-to-date electric motors and other machinery. The plant and business of the company were recently purchased by John T. Dillon and a number of capitalists of Titusville, Pa. Work will be resumed at once and the damaged portion of the plant rebuilt.

The Robertson Company, Peekskill, N. Y., will soon let contracts for the erection of a stove factory, 100 x 115 ft., Geo. W. Robertson, 257 Water Street, New York, is treasurer.

The Northern Iron Company, Port Henry, N. Y., has let contract to the West Side Structural Company, Watervliet, N. Y., for remodeling its factory and building an addition, 80 x 100 ft.

The Hood Furnace & Supply Company, Corning, N. Y., has completed plans for a plant which it will erect at once.

Pomeroy & Stellrecht, machinists, 60 Indiana Street, Buffalo, have taken out a building permit for a one-story reinforced concrete factory and machine shop which they will erect at Kensington and Fillmore avenues.

The Chevrolet Motor Company, 816 Eleventh Avenue, New York, which has acquired a large building for service purposes, is taking bids for a three and five-story addition, 100 x 150 ft., to cost about $20,000.

The Alexander Smith & Sons Carpet Company, Yonkers, N. Y., has started the construction of a one-story boiler house.

Plans have been completed by the commanding officer of the Watervliet Arsenal, Watervliet, N. Y., for alterations and additions to its shops to cost about $400,000.

The almshouse committee of Camden County, Camden, N. J., is taking bids for the construction of a one-story boiler house, 48 x 51 ft.

Millville, N. J., will take bids in a few weeks for a pumping station to cost about $2,000. Newton B. Wade is the engineer.

Catalogs Wanted

H. Miller, Ltd., Hazebrouck, France, desires to receive catalogs, descriptive matter, etc., covering tinning equipment, apparatus for blow pipe soldering and oxy-acetylene welding.

Philadelphia

PHILADELPHIA, PA., Sept. 18, 1916.

The Victor Motor Company, 1530 Chestnut Street, Philadelphia, has taken over the business of the Victor Car Company of Philadelphia, automobile maker. Twelve acres of land have been purchased at Grubbs Landing, Del., five miles north of Wilmington on the Pennsylvania Railroad, of which five acres are to be utilized by the Victor Motor Company for a plant and the other seven acres are to be developed by the American Guaranty & Trust Company of Wilmington for housing employees. The factory will be put up in units, the first being 80 x 425 ft., with a separate powerhouse. An engineer will be selected and bids will be taken in about two weeks. It is planned to have the structure complete by Dec. 1. It will be one story, of steel frame construction.

Edwin A. Moore, Robeson Street, below Weiser, Reading, Pa., manufacturer of special gray-iron castings, is building an addition to its coreroom, 40 x 60 ft., and has started the construction of an ell, 60 x 120 ft., to its foundry, which will call for an addition of about 50 per cent to the output, principally for special machinery castings.

The Pennsylvania Saw Company, Frackville, Pa., it is reported, will double its output for the next six months in order to fill a special order received. The working force will also be increased.

With the sale of the equipment of the Atlas Powder Company, at Mount Carbon, near Pottsville, hope of reopening this plant is now abandoned. The buildings were erected with the view that the war would last less than a year; and since the wooden structures were rotted out by the acid fumes, the company decided to close the plant.

The Keystone Door Check Company, Harrisburg, Pa., has started the construction of a factory at Palmyra, Pa., 28 x 70 ft., for the manufacture of hardware, etc., employing about 25 workmen at the start.

The Ingersoll-Trenton Watch Company, Trenton, N. J., has recently added 30 expert watchmakers and is planning to put on others this week. It is producing 1000 watches a day, but is to increase its output to 1200 shortly.

The Bethlehem Steel Company, South Bethlehem, Pa., has started the construction of a one-story boiler house, estimated to cost $50,000. The Stone & Webster Engineering Corporation, 147 Milk Street, Boston, Mass., is the engineer and builder.

George B. Hopkins, Hanover, Pa., maker of automobile bodies, etc., is taking bids for the construction of a one-story addition to his factory and office building, estimated to cost $12,000.

The Pennsylvania Equipment Company, Coleman Building, Philadelphia, is in the market for a second-hand plate punch, with 42-in. gap, to punch holes on 1-in. plate, and for a second-hand edge planer, open housings, 30 ft. long, to plane 1⅛-in. plates.

J. Pearce, 334 North Sixty-fifth Street, Philadelphia, has taken out permit for a machine shop, to be erected on Vine Street at a cost of about $500.

J. Alfred Clark, Thirty-fifth Street and Gray's Ferry Road, Philadelphia, has been granted a permit for an addition to his foundry to cost about $1500.

The W. Steele & Sons Company, 1600 Arch Street, Philadelphia, has been granted permit for the construction of a one-story brick and concrete powerhouse, 64 x 100 ft., for S. B. & B. W. Fleisher, Eighth and Chestnut streets, Philadelphia, at a cost of about $70,000.

Ford Bros & Co., 1610 South Front Street, Philadelphia, coppersmiths, have awarded contract to Henry C. Dahl, 231 South Eighth Street, Philadelphia, for the construction of a two-story brick and concrete machine shop, 30 x 74 ft., estimated to cost $3200.

The Watson Mfg. Company, manufacturer of incubators, brooders, etc., Lancaster, Pa., has awarded contract to Samuel H. Bally for the erection of its new plant at an estimated cost of $34,000.

The Department of Public Works, Philadelphia, is advertising for bids to be received until Oct. 3, for one pump of 25,000,000 gal. per day capacity for the Queen Lane Station and for another pump of 35,000,000 gal. per day capacity for the Lardner's Point Station. The total cost is placed at about $500,000.

New England

BOSTON, MASS., SEPT. 18, 1916.

There is but little change in the strike situation in the various New England cities now affected.

The Pennsylvania Seaboard Steel Corporation has bought the idle plant of the National Steel Foundry Company, Wheeler Street, New Haven, Conn. Frederick Wertz, who is to be superintendent of the New Haven plant, has a crew of men at work putting the shop in condition. It is expected that between 300 and 400 men will be employed.

The American Graphophone Company, Bridgeport, Conn., has awarded the contract for a power house, 80 x 85 ft., two stories.

The New York, New Haven & Hartford Railroad Company, New Haven, Conn., is asking bids on a roundhouse and repair shop, 48 x 136 ft., with two wings, each 40 x 50 ft., to be erected at Danbury, Conn.

The New England Westinghouse Company, Springfield, Mass., has awarded a contract for a factory building, 36 x 274 ft., one story, to be erected on Page Boulevard.

Work has been started on an addition to the plant of the National Scale Company, Chicopee, Mass.

The Arcade Malleable Iron Works, Worcester, Mass., is to build additions to its plant on Albany Street.

The Goodell-Pratt Company, Greenfield, Mass., is planning to build an addition, 40 x 80 ft., three stories.

The Bay State Metal Corporation, Brockton, Mass., is asking bids on the construction of a factory, 65 x 160 ft., one story; an office building, 32 x 43 ft.; and a boiler house, 24 x 38 ft.

The foundry to be built at Manchester, N. H., by George A. Leighton, as previously reported, will be occupied by C. E. Boulter and M. L. Webber, who have been connected with the United States Navy Yard, Kittery, Me.

The Howes-Larsen Tool Company, Milford, Conn., incorporated with capital stock of $25,000 by John T. Howes, Henry E. Larsen and Anton Christensen, will occupy the plant on Buckingham Avenue, formerly occupied by Thomas Bogan.

The Waterbury Mfg. Company, Waterbury, Conn., has awarded a contract for a factory addition, 104 x 200 ft., six stories, to be erected on North Main Street.

The Connecticut Company, Waterbury, Conn., has awarded a contract for an addition, 100 x 150 ft., two stories, to its machine shop on West Main Street.

Baltimore

BALTIMORE, MD., Sept. 18, 1916.

New additions and repairs planned by the Wilmington Steel Company, Wilmington, Del., will cost about $10,000.

Work is being rushed on the buildings for the Pyrites Company, Ltd., South Wilmington, Del. An office building has been completed and two large main buildings are being erected. E. G. Gray is manager.

The Central Metal & Supply Company, 609-611 East Lombard Street, Baltimore, has leased a building at North and Maryland avenues.

The Baltimore Copper Smelting & Rolling Company, Fourth Avenue and Fifth Street, Canton, Md., is considering the construction of additions to increase its output.

For the manufacture of portable bath equipment, the Kwick-Bath Mfg. Company, Petersburg, Va., has been formed. G. B. Baker is secretary-treasurer.

A power plant and mill will be built by the Richmond Lumber Company, Fourth and Decatur streets, Richmond, Va.

A large addition is being built to the plant of the Brylgon

Steel Casting Company, New Castle, Del., now owned by the American Manganese Steel Company, and it is understood manganese and welding furnaces will be installed.

It is stated that the Tindel-Morris Company, Eddystone, Pa., is rushed with orders for steel forgings.

Chicago

CHICAGO, ILL., Sept. 18, 1916.

Active selling of machine tools continues and in a steadily widening market among domestic manufacturers. The larger units are buying steadily, while the number of new organizations is perhaps larger than in a previous period of expansion. In standard lines of tools deliveries are still a handicap to sales and dealers are dependent upon the delivery of machines for which orders were placed as long ago as eight, ten and twelve months. The Italian Government is still a buyer of equipment for ammunition manufacture, while for shipbuilding and other industrial works in Italy a number of orders are reported. With all of the business that is still appearing, and despite the remoteness of a change in the disordered conditions of trade, conservative dealers are recognizing that the buying of equipment will reflect the earliest tendency toward a slowing up in demand and the process of repairing fences in natural territory is already being undertaken.

The Armstrong Brothers Tool Company, 333 North Francisco Avenue, Chicago, is building a steel and brick addition to its drop forging department, 50 x 70 ft., and is also erecting a reinforced concrete fireproof building, 60 x 130 ft., four stories, to be used as a finished stock warehouse, shipping department and offices. These additions will largely increase the company's facilities for taking care of its increasing business.

The Imperial Brass Mfg. Company, 1200 West Harrison Street, Chicago, Ill., manufacturer of brass specialties, is taking bids for an addition to its plant which will double its floor space, giving it a total of 50,000 sq. ft., and will more than double its present foundry space. The plant has been operating day and night for many months on domestic orders. The new equipment has been provided for.

The Chicago Hardware Foundry Company, Chicago, has awarded the contract for an addition to its plant.

The Golconda Portland Cement Company, Golconda, Ill., has been organized and will erect a plant at Golconda, Ill., which will cost $1,000,000.

The Bradley Foundry Company, Kankakee, Ill., has been organized with a capital of $5,000 by J. F. Cady, F. H. Seidel, O. Gommell and Edward Unruh.

The Bettendorf Oxygen Hydrogen Company, Davenport, Ja., has increased its capital stock from $50,000 to $100,000.

The Twin City Four Wheel Motor Drive Company, St. Paul, Minn., will erect an addition to its plant, to cost $30,000.

Indianapolis

INDIANAPOLIS, IND., Sept. 18, 1916.

The Studebaker Corporation, South Bend, Ind., has let contracts to James Stewart & Co., New York, for a machine shop, 300 x 900 ft., and a foundry, 150 x 1100 ft., to be erected on a site now occupied by the lumber yards of the company. According to the announcement the machine shop will have double the present facilities and the foundry will have four cupolas and a daily melting capacity of 250 tons. The buildings will be ready for occupancy by July 1, 1917. The cost of the improvements is estimated at $1,500,000.

Fire destroyed the machine room at the plant of the McDougall Kitchen Cabinet Company, Frankfort, Ind., Sept. 15.

The Hiatt Mfg. Company, Winchester, Ind., has been incorporated with $10,000 capital stock to manufacture furniture, office fixtures and novelties. The directors are G. E. Leggett, E. R. Hiatt and A. F. Huddleston.

The Fehring Carriage Company, Columbus, Ind., is building two additions to its plant, 27 x 100 ft. and 50 x 50 ft., respectively.

The National Tile Flooring Company, Connersville, Ind., has been incorporated with $50,000 capital. The directors are Edward P. Hawkins, Charles A. Rieman and Marion K. Jamison.

The Anthony Auto Lifter Company, Ft. Wayne, Ind., has been incorporated with $10,000 capital stock to manufacture auto lifters and other devices. C. O. Blee, W. O. Chaney and G. F. Seymour are the directors.

The Remy Electric Company, Anderson, Ind., will build a three-story addition to its plant, 60 x 245 ft. The engineers are Shank & Williams, Dayton, Ohio.

Detroit

DETROIT, MICH., Sept. 18, 1916.

The demand for machine tools continues to be unusually brisk, with the shops reporting excellent prospects for a record fall trade. Inquiries were greater and more tools were bought the past week than since early last spring. The delivery on some makes of machines, particularly lathes, has improved; but standard machines are requiring from four to seven months for shipment. The demand for woodworking machinery has lessened. Metal workers in Detroit are paying from 30 to 40 per cent of their wages in most cases for rent, and are reported as leaving the city. The lack of housing facilities in the larger cities of Michigan has caused increasing dissatisfaction among laborers, many of whom are moving to Cleveland and Chicago. Collections in all fields in Detroit are excellent, but the tendency in the investment of money is now toward conservatism.

The Federal Motor Truck Company, Detroit, is planning the erection of another addition to its plant to take care of the office and administrative forces. The additions to the factory are nearly completed and machinery is being installed. The company plans to double its output next year. M. L. Pulcher is vice-president and general manager.

The new Harroun Motors Corporation, recently incorporated with a capital stock of $10,000,000, has purchased the Prouty & Glass Carriage Company's plant at Wayne, Mich., with adjacent land, and is planning to begin the manufacture of popular-priced automobiles at once. An addition to the plant will be constructed. Ray Harroun, president of the new company, is expected to be in Wayne this week.

It is stated that the Pennsylvania system has purchased 250 acres of land just west of the new Harroun Motors Corporation plant in Wayne for the establishment of division headquarters and sidings.

The Kalamazoo Paper Company, Kalamazoo, Mich., is planning to put up a new coating mill to cost about $150,000, while the Riverview Coated Paper Mill Company will build a factory to cost $500,000. The two companies, composed of the same stockholders, have operated the two factories as separate parts of the same plant until recently.

The International Metal Stamping Company, Detroit, has been incorporated for $300,000 to manufacture stamped metal goods. The principal stockholders are O. L. Currier, 146 Philadelphia Avenue, Detroit, and F. J. Fisher, 110 Chandler Avenue.

The Sligh Furniture Company, Grand Rapids, is to add one story to its main plant.

The Knapp Machine Company, North Avenue, Grand Rapids, is to construct a new building.

The Grand Rapids Salvage Company has secured contracts for part of the steel for the addition to the Floor Board Company's plant at Ionia, Mich., and the Excelsior Wrapper Company's addition to its plant on Godfret Avenue, Grand Rapids.

The New Era Spring & Specialty Company, Detroit, has been incorporated for $50,000 by William S. Daniels, 864-878 Woodward Avenue, Detroit; Ethel B. Fulmer and William B. Blood.

Within 60 days the entire plant of the National Twist Drill & Tool Company, Detroit, will be in operation. A total of 150,000 sq. ft. of floor space has been added to the plant, the present output of which is 20,000 drills daily, along with cutters, reamers and special tools. The company was established in 1903 and now employs 500 men.

The Ideal Foundry Company, Grand Rapids, has awarded contract for its pattern shop and office building to H. Hofstra & Son, Grand Rapids. It will be 40 x 100 ft., two stories, of brick and mill construction.

The Kalamazoo Malleable Iron Company, Kalamazoo, Mich., has been incorporated for $125,000 by W. S. Dewing, Dwight L. Curtenius and George S. Burdeen.

The Grand Rapids Refrigerator Company, Grand Rapids, is planning an addition to its enameling plant.

Five demonstration cars are being built for the General Engineering Company, Detroit, recently incorporated for $200,000 to manufacture a steam automobile with either gasoline or kerosene as fuel. The company will plan shortly to manufacture the cars on a large scale. Among the officers of the company are Claude L. Lewis, 2704 West Grand Boulevard, Detroit, and Morgan J. Hammers, 805 Pasednena Apartments, Detroit.

The National Brass Company, manufacturer of brass hardware, Grand Rapids, Mich., has filed plans for the erection of a two-story addition, 45 x 185 ft., to be used as a boiler and engine room and as a plating, tumbling and lacquering room. It also contemplates building an iron and

brass foundry soon. L. A. Dexter is vice-president and manager.

The Keller Pneumatic Tool Company, manufacturer of shipping, caulking and riveting hammers, etc., Fond du Lac, Wis., will remove to Grand Haven, Mich., following the completion of a new plant there, which will take some months more. A branch plant will be maintained at Fond du Lac. Work will be started at Grand Haven on the construction of the first of three factory buildings, 90 x 300 ft. The company will be capitalized in Michigan with a capital stock of $200,000. W. H. Keller is president and general manager. The production of jigs, fixtures, gages, punches, dies, boring bars and other special tools has been added to its product.

The Chopa Piston Ring Company, Detroit, was recently incorporated with a capital stock of $500,000, not $1,000,000, as was stated in the IRON AGE of Aug. 31.

The plant of the National Silica Company, Monroe, Mich., was destroyed by fire with an estimated loss of $50,000.

The Campbell Foundry Company, Muskegon, Mich., has let the contracts for its new building, work to be begun at once.

The Republic Motor Truck Company, Alma, Mich., has announced that it will erect a new 1000-ft. brick building. The company has recently increased its capital stock from $500,000 to $1,000,000 and this is the third addition to its plant within a year.

Cincinnati

CINCINNATI, OHIO, Sept. 18, 1916.

Steel mills are reported to have lately ordered more machine tools than at any previous time in the history of the local trade. While lathes predominate in these purchases, radial drilling machines were also in demand. The demand for shaping machines is also good. Business from munition manufacturing plants has fallen off to only single tools for replacement purposes. Auto-truck and automobile makers are contracting for more tools than they were a month ago, but in some cases deliveries are hard to obtain on time. The second-hand machinery business is good, but the call for small lathes does not seem to be as brisk.

In spite of the high cost of material and labor, quite a lot of construction work on manufacturing plants is going on or contemplated. Foundations for the large plant of the American Tool Works Company have been completed and it is hoped to have the buildings completed before Jan. 1. Work is also progressing rapidly on the new plant of the R. K. LeBlond Machine Tool Company. The Cincinnati Planer Company's new addition is nearing completion, and as previously noted the Cincinnati Milling Machine Company recently took out a permit for an addition to its plant estimated to cost $30,000. Other smaller additions to different plants are either under way or contemplated.

Cullen & Vaughn, contractors, Hamilton, Ohio, have been awarded a contract for an addition to the plant of the Fisher Can Company.

The Colin-Gardner Paper Company, Middletown, Ohio, contemplates making changes in its power plant. Equipment details are not yet available.

The Quartz Spark Plug Company, Dayton, Ohio, has been incorporated with $25,000 capital stock by B. F. Weaver and others.

It is reported that the Seagrave Mfg. Company, Columbus, Ohio, manufacturer of motor-driven fire fighting machines, is contemplating adding to its manufacturing facilities. An addition to its plant has just been completed.

R. A. Jones & Co., Covington, Ky., makers of soap presses, are in the market for a universal cutter and reamer grinder. They recently completed a large plant that is now in full operation.

Cleveland

CLEVELAND, OHIO, SEPT. 18, 1916.

The Peters Machine & Mfg. Company, Cleveland, will enlarge its plant by the erection of a one-story brick addition, 120 x 209 ft.

The American Fork & Hoe Company, Cleveland, will shortly begin large extensions to its plant at Geneva, Ohio. These will include a two-story brick building, 40 x 60 ft., and an extension, 42 x 109 ft., to its forge shop. Other extensions previously announced are now under way.

The D. & M. Mfg. Company, Cleveland, Ohio, has purchased the site and building of the Ohio Sash Weight & Foundry Company in Youngstown, Ohio, and will establish a plant for the manufacture of gas and gasoline flatirons and other metal specialties. It is said the plant will be enlarged by the erection of a new building, 40 x 150 ft.

The Ohio Blower Company, Cleveland, Ohio, has purchased a two-acre site on Detroit Avenue near West Ninety-first Street and extending back to the Nickel Plate Railroad, and will shortly begin the erection of a new plant. Plans for the first unit, a four-story building, 60 x 200 ft., have been prepared by the Osborn Engineering Company. In additions to its present production of ventilators, exhaust systems, etc., the company will manufacture automobile bodies.

The Packard Electric Company, Warren, Ohio, will enlarge its plant by the erection of a three-story and basement building, 64 x 140 ft. When completed the capacity of the plant will be more than double. The company manufactures transformers, insulating material and other products.

It is announced that a manufacturing plant will be established in Ravenna, Ohio, by the United Factory & Machine Company, which will be organized with a capital stock of $125,000 by William Blecker of Canton, Ohio.

The Kelly-Springfield Tire Company, Springfield, Ohio, has placed contracts for the erection of a three-story addition to its plant at Wooster, Ohio. It will be 48 x 50 ft.

The Buckeye Aluminum Company, Wooster, Ohio, will enlarge its plant by the erection of an extension, 70 x 100 ft., permitting it to double its output; and will also build a power plant, in which will be installed a 250-hp. engine.

The Sterling Company, Wellington, Ohio, will shortly begin the erection of a new foundry building, 60 x 120 ft.

The Gartland & Carroll Foundry Company, Sandusky, Ohio, has been incorporated with a capital stock of $100,000 by John J. Carroll, Thomas H. Gartland and others. The company has commenced the erection of a gray iron foundry.

The Herrold Tool & Forge Company, Columbiana, Ohio, has been incorporated with a capital stock of $25,000, to succeed the Herrold Tool Company, and will manufacture hand tools and other products.

Milwaukee

MILWAUKEE, WIS., Sept. 18., 1916.

Milwaukee machine tool builders are getting further behind on orders, due to the insistent domestic demand for all classes of machines. One large maker of milling machines is 60 days behind and is sold up to May 1 on some lines, while capacity on others is fully occupied until July 1, 1917. The major part of the demand is for single tools, standard types, but numerous bookings are for small lots. Export business is almost negligible in the total volume of transactions. Tool builders continue to increase their capacity, but find it inadvisable to enlarge plants to the desired point because of the scarcity of labor. The machinists' strike, which is still going on, but slowly waning, has made necessary extraordinary efforts to whip unskilled labor into shape. Plant extensions are more generally reported, and a number of enlargements will be carried out the coming fall and winter. The metal-working industry is rapidly improving and indications point to a more profitable winter than a year ago.

The Waukesha Motor Company, Waukesha, Wis., maker of automobile, truck and tractor motors, has increased its capital stock from $200,000 to $1,000,000 to provide for extensions and to better accommodate the rapidly expanding business. A new administration building is under construction, and tentative plans are being prepared for large additions to the testing and machine shops. The assembling department will also be increased.

The P. B. Yates Machine Company, Beloit, Wis., manufacturer of sawmill and wood-working machinery, is rushing work on the new machine shop and general manufacturing building undertaken some time ago. It will be 266 x 296 ft., occupying a full city block, and affords 110,000 sq. ft. of floor space. The structure will contain a craneway, 64 ft. wide, 275 ft. long, and 30 ft. in the clear, equipped with a 10-ton electric crane. Lateral craneways, with 2-ton and 3-ton cranes, lead to the interior. Three large freight elevators, as additional facilities for handling materials will also be installed. The capacity of the plant will be increased from 40 to 50 per cent.

The Kearney & Trecker Company, maker of milling machines, West Allis, Wis., which has been making numerous additions to its plant, has broken ground for a new blacksmith shop, 54 x 64 ft.

The Argola Investment Company, Milwaukee, is taking bids for the erection of a garage and repair shop, 50 x 150 ft., two-stories and basement.

The Steam Appliance Company, Sixty-third Avenue and

Burnham Street, West Allis, has awarded contracts for the construction of a foundry, 50 x 52 ft.

The Gorton Machine Company, Racine, Wis., has awarded contracts for the erection of a brick and steel machine shop, 75 x 180 ft., one-story, to be ready about Dec. 1. E. B. Funston & Co., Racine, are the architects.

J. H. Light, Kaukauna, Wis., will build a garage and repair shop, 50 x 100 ft.

The Agrimotor Engineering Company, LaCrosse, Wis., has been organized by C. W. Lewis, for many years sales manager of the LaCrosse Plow Company, and will design farm implements, tractors and accessory lines, and act as agent for patentees and manufacturers.

It is reported that the Lyons Boiler Works, DePere, Wis., which has been closed for nearly a year, will resume operations Oct. 1 under the management of the Joliet Bridge & Iron Company, Joliet, Ill.

The Capitol Culvert Company, Madison, Wis., is making tentative plans for rebuilding the steel culvert plant destroyed by fire Sept. 10, with a loss of $35,000.

The Industrial Controller Company, 886 Greenbush Street, Milwaukee, maker of electric controlling devices and machine shop appliances, is preparing to triple the size of its main shop by a two-story addition, 60 x 125 ft. Henry C. Hengels, architect, Milwaukee, is in charge.

The Parker Pen Company, Janesville, Wis., manufacturer of fountain pens, is reported to be contemplating the erection of a new factory to cost about $75,000. George S. Parker is president.

The Christensen Engineering Company, Milwaukee, which increased its capital stock from $300,000 to $1,000,000, will increase its facilities for the production of compressed air starter mechanism for internal combustion engines. The company has a large volume of orders, both domestic and export. Plans for enlargement are not quite mature, but are said to contemplate new construction and machine-tool equipment. Nels A. Christensen is president.

The John Dotsch Steel Metal Works, 412 Grand Avenue, Menominee, Mich., has been purchased by the Square People's House Furnishing Company, which will continue operations and specialize in hot air furnaces and stoves. Clarence Peterson is retained as manager.

The Eau Claire Mfg. Company, Eau Claire, Wis., has completed the transfer of the equipment, patterns, jigs, tools and other machinery of the Bloomer Machine Works to the Eau Claire plant. It will manufacture the Keller gasoline engine and continue to do general machine repairing, brass and gray iron casting, welding, etc. The Bloomer works will discontinue operations and the plant will be sold.

The H. F. Roehrig Company, Arpin, Wis., is erecting a two-story reinforced concrete garage and shop, 48 x 80 ft.

The Riverside Paper & Fibre Company, Appleton, Wis., is electrifying its entire plant, enlarging the machine room capacity 100 per cent, and making other improvements and changes costing nearly $100,000.

The Felker Brothers Mfg. Company, Marshfield, Wis., maker of steel culverts, road drags and farm machinery, is erecting another main shop addition, 42 x 80 ft., and a small welding and cutting shop.

The Central South

LOUISVILLE, KY., SEPT. 18, 1916.

Wood-working and construction equipment, including boilers and dynamos and various types of hoisting apparatus with power attachments, are in big demand. Inquiries continue numerous and the outlook is for a busy winter. Dealers are unanimous in saying that they could increase sales largely if they could get deliveries promptly. A considerable proportion of current inquiries make early shipment a condition.

The Smokeless Piston Ring Company, Lexington, Ky., has been incorporated with capital stock of $3000, and will manufacture. The incorporators are E. M. McKee, Bradley Wilson and M. Don Forman. The company is authorized to incur an indebtedness of $25,000.

The Flickerless Shutter Company, Louisville, Ky., has been incorporated, with capital stock of $60,000, to manufacture a shutter for moving picture projection machines. M. C. Fullenlove, E. F. Stemmelen and Emanuel Levi are the incorporators.

J. E. Greenleaf and L. B. Herrington, Richmond, Ky., who recently incorporated a company to establish a hydraulic power plant on the Dix River, near Lancaster, Ky., to develop 2800 hp., announce that they will push the project.

The Kentucky Utilities Company, Lexington, Ky., is announced to have been the purchaser, through S. Walton Forgy, Elkton, Ky., of the Princeton Electric & Ice Company at Princeton, Ky. The plant will be considerably improved.

The Nicholson System Fuel Saving Device, Louisville, Ky., recently incorporated with $20,000 capital, has changed its name to the Nicholson Grate Mfg. Company.

The plant of the Paducah Box & Basket Company, Paducah, Ky., was damaged to the extent of $10,000 by fire.

The Van Buren County Railroad Company, Chattanooga, Tenn., has been incorporated with capital stock of $300,000 to build and operate a steam railroad. The incorporators are E. N. Haston, J. J. Lynch, C. P. Cuthbert, I. G. Phillips and M. M. Allison.

The Columbian Iron Works, Chattanooga, Tenn., which is working on a contract for 50,000 6-in. shells for the British army, is reported to have secured a second contract for 100,000 of the same shells. H. M. Lofton is superintendent.

A. J. Sheldon, Bristol, Tenn., will rebuild the garage recently burned at a loss of $12,000.

The Maryville Ice & Packing Company, Maryville, Tenn., contemplates increasing the capacity of its ice-manufacturing plant from five to 20 tons.

The City Commission, Memphis, Tenn., announces that it will proceed at once to sell $1,500,000 of municipal bonds, and to build the authorized electric light and power plant. F. W. Ballard, Cleveland, Ohio, is engineer for the commission.

The John G. Duncan Company, Knoxville, Tenn., is asking for dealers' prices on 100-hp. locomotive or Scotch marine boilers, and also on 125 50-hp. Scotch marine boilers.

The Nashville Railway & Light Company, Nashville, Tenn., has installed a 2000-kw. motor generator at its local steam plant. Most of the company's power is from transmission lines of the Tennessee Power Company.

The Day Pulverizer Company, Knoxville, Tenn., recently incorporated with a capital stock of $10,000 to manufacture pulverizers for farming, which is at present having its machines made on contract by a local manufacturer, desires to get in touch with manufacturers specializing in the production of hard steel shapes or finished parts. The company will sign a contract for the manufacture of hammers for its machines. James A. Day is general manager.

St. Louis

ST. LOUIS, MO., SEPT. 18, 1916.

Business has continued good in the machine-tool trade, with no special outstanding feature. Dealers are quite well equipped to take care of requirements, except where immediate delivery is essential. No large lists are coming into the market, though the aggregate of single-tool demand is good.

The Tevis Motor Company, St. Louis, Mo., has been incorporated with a capital stock of $15,000 by C. H. and L. G. Tevis and E. J. Mauntel.

The Ayres Automobile Company, St. Louis, Mo., has been incorporated with a capital stock of $15,000 by Joseph T. and C. E. Ayres and Samuel Breadon.

The Excelsior Springs Water, Gas & Electric Company, Excelsior Springs, Mo., will install a 575-kw. electric generator, direct-connected to Corliss engine.

The Standard Motor Corporation, Kansas City, Mo., has been incorporated with a capital stock of $20,000 by R. W. Garrett, M. P. Comstock, C. F. Bolton and others.

The Southwestern Rubber Company, Kansas City, Mo., has been incorporated with a capital stock of $16,000 by Harry A. Young, George F. Knight and Benson Stephens to manufacture rubber casings and tubes.

The Queen City Auto & Truck Company, Springfield, Mo., has been incorporated with a capital stock of $16,000 by Joseph L. Carroll, Oliver Wyatt and Charles H. La Rue.

The Stoeker-Smith Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $20,000 by Arnold L. Stoeker, Wright Smith and Samuel M. Woodson to manufacture hotel kitchen equipment.

The Citizens Gin Company, Texarkana, Ark., has been incorporated with a capital stock of $10,000 by A. M. McDaniel, H. Clark, F. E. Wilson and others and will establish a cotton gin.

The Farmers' Gin Company, Texarkana, Ark., has been incorporated with a capital stock of $10,000 by J. W. Smith, H. F. Borcherding and C. H. Schroeder and will erect a ginning plant.

Thomas N. Crumpler, Lowry, Ark., will re-equip his burned cotton compress and gin, requiring a boiler, gin stand, engine and other equipment.

The Planters' Cotton Oil Company, Pine Bluff, Ark., has been incorporated with a capital stock of $125,000 by Leo

M. Andrews, D. B. Niven and T. H. Gregory and will add equipment to a plant which they have acquired.

Henderson & Wood, Walnut Springs, Ark., will erect a garage, 60 x 100 ft., and install machine-shop equipment.

The V. M. Lord Mfg. Company, Oklahoma City, Okla., will install equipment for the manufacture of oil cans, iron drums, etc. V. M. Lord is president; O. H. Smith, vice-president, and E. B. Lord, secretary.

The Blue River Power Company, Oklahoma City, Okla., has been incorporated with a preliminary capital of $15,000 by W. M. Lucas, W. H. Bingham and D. C. Teter, all of Tishomingo, Okla., and will equip a hydroelectric plant.

The Anderson Motor Sales Company, Muskogee, Okla., has been incorporated with a capital stock of $15,000 by C. C. Anderson, W. W. Anderson and C. L. Anderson.

Granite, Okla., will build a waterworks plant to cost about $25,000. The Benham Engineering Company, Oklahoma City, Okla., is preparing plans.

Wetumka, Okla., will expend about $40,000 on its waterworks plant.

Birmingham

BIRMINGHAM, ALA., Sept. 18, 1916.

A steady increasing demand for hydroelectric machinery is incident to the conversion of old steam plants and the fitting of new ones with electric apparatus. High prices and delay in delivery have stopped some proposed structural operations. The movement of wood-working machinery is quite good. The autumnal prospect gets better as the days pass.

The Louisville & Nashville Railroad, W. H. Courtenay, Louisville, chief engineer, has plans prepared for the expenditure of $80,000 in rehabilitating coal docks at Mobile, Ala. The plans include electrically operated hoists, etc.

The Birmingham Slag Company, Birmingham, will add crushing machinery at a cost of $75,000. C. E. Ireland is manager.

The Tennessee Chemical Company, Americus, Ga., will double the capacity of its plant.

The Bird-Wilcox Company, Atlanta, manufacturer of oxy-acetalyne welding and cutting apparatus, will build an addition to its plant.

The Pacific Northwest

PORTLAND, ORE., Sept. 12, 1916.

The past week has brought some improvement in business. Shortage of cars and ships still hamper the movement of crops and lumber, but conditions generally are prosperous. The Southern Pacific is short approximately 1100 cars in Oregon and prospects for any material relief in the immediate future appear slight.

The rush of shipbuilding at the large tidewater plants has thrown an overflow of jobbing work to many small shops at both coast and interior points, resulting in many inquiries for standard tools, and despite present prices many additions are being made. Large buying is done mainly by marine plants, which appear to have covered their principal requirements, but are still placing scattered orders for special equipment. A healthy demand is noted everywhere for power equipment and miscellaneous machinery.

The Alaska business is steadily growing. Shipments from that territory in August, most of which passed through Seattle, included copper ore valued at nearly $3,000,000, canned salmon worth over $2,000,000, and nearly $2,000,000 in gold bullion. New construction continues at many Alaskan mines and the salmon canning interests are preparing to make many improvements the coming year.

The Northwest Steel Company, Portland, is preparing to lay the keels for two more steamers this month, having two already under construction.

The St. Helens Shipbuilding Company, St. Helens, Ore., has six sets of ways ready for the construction of wooden vessels, all of which are to have either steam or oil engines, with full equipment of lumber-handling machinery.

The sawmill of the Oregon Lumber Company, Baker, Ore., was recently destroyed by fire, with a loss of $40,000.

The Wallace Shipyards, Vancouver, B. C., has recently laid the keel for a steel steamship of 5000 tons, 300 ft. long, ordered by the Kishimoto Steamship Company of Osaka, Japan.

Plans for a lumber mill of 200,000 ft. daily capacity, to be built at Sutherlin, Ore., for W. L. Roach, of Muscatine, Iowa, are being prepared by A. B. Pracna, Seattle.

The Grays Harbor Shipyards, Aberdeen, Wash., will lay the keel shortly for a third Swayne-Hoyt vessel, 290 ft. long, with capacity of 2,000,000 ft. of lumber.

J. F. Duthie & Co., Seattle, have completed plans for their one-story machine shop, 90 x 180 ft., to be constructed at 3262 Kitsap Avenue at a cost of $5,000.

Announcement has been made that A. O. Anderson & Co., of Norway, will place an order for a fleet of lumber carriers to cost $22,000,000. They have established offices in Seattle and Portland. Fourteen vessels have already been contracted for in Pacific coast yards, two of 10,000 tons and six of 8000 tons cargo. The remaining six vessels will be auxiliary power schooners. Five are now under construction at Astoria, Ore. Orders for lumber carriers will also be placed shortly. The boats now under construction will be rated at 85,000 tons aggregate cargo capacity.

The Vancouver Shipyards, Ltd., Vancouver, B. C., contemplates enlargements to its yard, which will more than treble the present size.

The Seattle Construction & Dry Dock Company, Seattle, will construct a floating drydock with a tonnage of 12,000 tons to cost between $400,000 and $500,000. Work will begin immediately.

The plant of the Oregon-Portland Cement Company, Oswego, Ore., will be re-opened Oct. 1 to full capacity.

The Wellington Coal Company, Seattle, plans the establishment of a coal-handling plant on Latona Avenue to cost $25,000.

The Three Ply Veneer & Box Company, Seattle, has been incorporated for $500,000 by J. H. Moore, W. T. Coleman and N. M. Vedder. It is understood the plant will be established in the vicinity of Seattle.

The plant of the Midland Lumber Company, Midland, Wash., valued at $75,000, which was destroyed by fire recently, will be rebuilt immediately. D. A. Swan is president.

E. L. Clark, St. Maries, Idaho, is interested in a new company which has purchased the plant of the Modern Box Factory Company. It has a capital stock of $25,000, and will be known as the St. Maries Modern Box Factory Company. The plant will be completely remodeled and new machinery installed. Mr. Clark will be president and general manager.

Texas

AUSTIN, TEX., Sept. 16, 1916.

An unusually large demand exists for machinery for manufacturing plants of various kinds. Much attention is also being given to improving public utility plants. The demand for machinery for rehabilitating industries in Mexico shows a marked increase, now that the railroads of that country are again open for regular traffic.

The Texas Southern Electric Company, Kingsville, will install new machinery in its electric light and power plant.

The San Antonio, Gonzales & Houston Interurban Company has been reorganized and is surveying a new route for its proposed electric railway between San Antonio and Houston, 225 miles distant. Steve Holmes, Leesville, Tex., is president. An electric power station will be built.

The Mission Ice & Fuel Company, Mission, will install new machinery in its ice factory to cost about $50,000.

The Whitewright Oil Mill Company, Whitewright, has been incorporated with a capital stock of $35,000 to build and operate a cotton-seed oil mill. D. S. McMillan is a stockholder.

The Greenville Cotton Oil Company, Greenville, will install machinery for cleaning, shelling, sorting and crushing peanuts. The plant will cost about $35,000.

The Panhandle Gin Company, Quanah, will build a cotton gin to cost about $15,000. G. A. Simmons is a stockholder.

The City Commission of Houston has approved plans for two additional units of the municipal wharves which are to be built at an estimated cost of $185,000.

Canada

TORONTO, Sept. 16, 1916.

Canadian trade is far above that of any previous period in the country's history. Exports of manufactured articles are considerably in excess of imports. Nearly all iron and steel makers turning out shells and other munitions, as well as those working for the domestic trade, are operating their plants at full capacity. The scarcity of labor has latterly been a great drawback to manufacturers, who have been compelled to take on women to fill the places formerly occupied by men, but as farming operations are pretty well over for the season, more men are becoming available in

the urban labor market. This will be a much needed factor in the filling of war orders and will add to the productive power of Canadian plants. Many new factories are being erected throughout the Dominion, a considerable number of which are branches of companies in the United States. New additions are being erected to old plants which find difficulty in keeping up with their orders, and in anticipation of a greater volume of business at the conclusion of the European war.

During August, as in July, the output of Canadian munition factories was less than anticipated, one of the reasons being the high temperatures which were very general. Some factories were shut down for brief periods because of inability to get parts, and others were closed for lack of efficient labor. A broadening tendency in the demand upon industrial plants is more evident. Manufacturers who lost their trade when the war broke out are adapting their plants to produce articles for which there is now a market. Great mining activity and the more vigorous exploitation of forest wealth are creating heavy demands upon engineering plants, some of which have on their hands more orders than in normal times.

The Canada Cycle & Motor Company, a subsidiary of the Russell Motor Company, is erecting a plant at Weston, Ont., for the manufacture of bicycles, skates, etc., which will cost in the neighborhood of $500,000. T. A. Russell, 276 King Street West, Toronto, is president of the company.

The Maple Leaf Tires, Ltd., has secured a factory site of 22 acres at Belleville, Ont., and building operations will be commenced at once. The main building will be nearly 300 ft. long and will be of concrete and steel construction and will cost, approximately, $100,000.

The Peter Lyall & Sons Construction Company, Montreal, has completed arrangements with the Canadian Pacific Railway for the rental of a 300-ft. strip of land adjoining the Lyall Company's shell plant, in Westmount, Que.

It is reported that contracts have been let to the Foundation Company, Ltd., Montreal, for the International Nickel Company's plant to be located at Port Colborne, Ont., on the east side of the lake front. The works will cover a site of 23 acres and will cost more than $3,000,000.

The Dauphin Milling Company, Dauphin, Man., is in the market for a Corliss engine, head flywheel to right, size about 15 x 36 in. stroke.

The Pacific Steel Products Company's plant at Vancouver, B. C., was totally destroyed by fire Sept. 11, with a loss of $150,000. The plant had been in operation for only five weeks.

Plans for the construction of a waterworks for Kitchener, Ont., have been approved by the Provincial Board of Health The plant will cost $100,000. Herbert Johnston is engineer.

Plans are being prepared for the erection of a galvanizing plant for the McClary Mfg. Company at London, Ont., to be of brick and concrete construction and cost $30,000.

The Canadian Ingersoll-Rand Company, Sherbrooke, Que., is building a machine shop there to cost $70,000.

The John Inglis Company, 14 Strachan Avenue, Toronto, has commenced the erection of a brick and steel forge plant to cost $6,000.

Ewing & Murphy, 18 Cameron Street, Toronto, has commenced rebuilding its planing mill to cost $6,000.

The Canadian Northern Railway, Winnipeg, has let the contract for the erection of a machine shop at Rainey River, Ont., to cost $8,000.

The Sheet Metal Products Company of Canada, River and Gerrard streets, Toronto, has let the contract for the erection of an addition to cost $6,500.

C. J. Mitchell, Brantford, Ont., has let the contract for the erection of a garage to cost $20,000.

Fire destroyed the plant of the Canadian Canners and badly damaged the Laidlaw Lumber Mill at Sarnia, Ont. The damage will amount to $50,000.

R. H. Buchanan & Co., 234 Craig Street West, Montreal, are in the market for a 16-in. x 6-ft. pin-turning lathe.

The Consolidated Steel Foundries, Ltd., Montreal, has been incorporated with a capital stock of $500,000 by Louis E. Bernard, Wilfred A. Handfield, John A. Sullivan and others to manufacture rails, machinery, tools, implements, etc.

The Canadian Zinc Products Company, Ltd., Montreal, has been incorporated with a capital stock of $45,000 by Robert F. Macy, Portland, Me.; Leland D. Adams, Arthur R. Holden and others of Montreal, to manufacture metals, zinc products, etc.

The Canadian K. K. Company, Ltd., Elora, Ont., has been incorporated with a capital stock of $40,000 by Charles L. Dunbar, Leo W. Goetz, Helen M. McTague, John Sutherland and others, all of Guelph, Ont., to manufacture machinery, iron, steel, etc.

The factory on Buchanan Street, Toronto, owned by the Harry Webb Company, was totally destroyed by fire with a loss upward of $100,000. The machinery destroyed was stated to be exceptionally valuable and the cost of replacing it will be in the neighborhood of $75,000.

Henry Schaake, machinery dealer, New Westminster, B. C., has leased a site on Tenth Street, on which he proposes to erect a machine, pattern and boiler shop to cost about $70,000. Work will begin immediately.

Government Purchases

WASHINGTON, D. C., Sept. 18, 1916.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 138, for eight turret-turning motors; schedule 139, for two emery grinding machines, two woodworker's lathes, two motor-driven drill presses, two 30-in. motor-driven band saws and two motor-driven saw tables, all for Brooklyn; schedule 143, for four water-tube boilers for Norfolk; schedule 160, for 16 portable electric drilling machines, 16 portable bench grinding machines and 16 screw cutting lathes, for various navy yards.

The chief of ordnance, War Department, Washington, will receive sealed proposals until Oct. 11, for furnishing 50,000,000 rounds of ball cartridges, caliber 0.30, model 1906.

The purchasing officer of the Panama Canal, Washington, will receive under circular 1081 proposals for furnishing one duplex air compressor.

The chief signal officer, War Department, Washington, will receive bids until Oct. 12, under proposal 849, for furnishing primary aeroplanes in lots of from six to eighteen.

The following bids were received by the chief of ordnance, Navy Department, Sept. 13, for furnishing 1200 14-in. target projectiles:

The Birmingham Machine & Foundry Co., Birmingham, Ala., $63.95 each; begin delivery 200 days, will deliver 100 each month thereafter.

The Tredegar Company, Richmond, Va., $70.95 each; begin delivery 253 days, will deliver 250 each month thereafter.

The Bethlehem Steel Company, South Bethlehem, Pa., $94.86 each; begin delivery one year, will deliver 400 each month thereafter.

The Raleigh Iron Works Company, Raleigh, N. C., $76.95 each; begin delivery 500 days, will deliver 150 per month.

Beginning Oct. 15, the Johns Hopkins University, Baltimore, will give evening courses in engineering, in order that those engaged during the day may have an opportunity to continue their technical training. Three branches will be taught—mechanical, civil, and electrical. There will be lectures on all the subjects, as well as practical work in the laboratory and drafting room. While some of the instructors will be selected from those now teaching at the university, others will be added to the staff.

The Hook Foundry Company, Marcus Hook, Pa., has been formed and is now turning out gray-iron castings. James F. Powers, who formerly operated a foundry at Elkton, Md., is the general manager. The buildings used were formerly occupied for the manufacture of steel products, but the plant was closed a number of years ago. All the machinery has been improved and brought up to date.

The Howell Electric Motors Company, Howell, Mich., manufacturer of squirrel-cage and slip-ring polyphase electric motors, in all standard speeds and from one-half to 100 hp., has increased its capital stock from $30,000 to $100,000. H. N. Spencer is president; C. L. Daun, vice-president and manager; W. M. Spencer, secretary-treasurer, and C. F. Norton, sales manager.

Rectangular flat end gages, guaranteed accurate to within 0.00001 in., are now made as an American product by Wismach & Ibsen, 1513 Richards Street, Milwaukee. They are obtainable in sets for either inches or millimeters, together with holders for the various combinations of the gages for given lengths.